MODEL AIRPLANE NEWS

10th Year of Publication

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Rising thermals are out there just waiting to carry your model 'way up . . . up into the lazy, azure blue skies. Honest, fellows, it's a real thrill to watch *your* model soar aloft, steadily climbing, dipping in and out of snow white clouds. Why delay? Get a *PROVEN* 'BURD' flying endurance model that has been time tested. Take full advantage of the present flying weather. See our offerings below.

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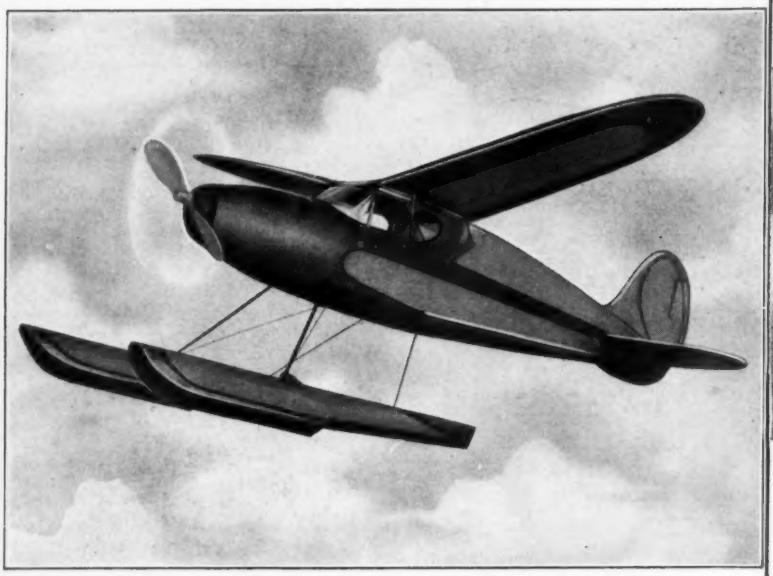

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Shaped prop block, each	30c
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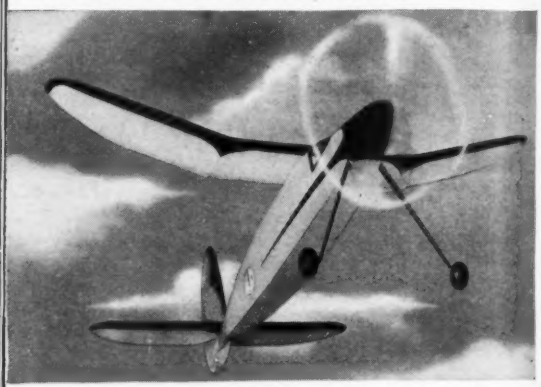

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IN CONJUNCTION WITH THE FEATURE PICTURE

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STARRING

CLARK GABLE
MYRNA LOY
SPENCER TRACY
WITH LIONEL BARRYMORE

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1. Anyone can enter except Model Airplane News and Metro-Goldwyn-Mayer employees.
2. There is no entry fee. Send, or take, your essay to "Test Pilot" Contest, Model Airplane News, 551 Fifth Avenue, N.Y.C., or M.G.M., 1540 Broadway, N.Y.C.
3. The contest is open now and closes September 1st, 1938.
4. Essays will be judged for originality and neatness. The decisions of the judges will be final.

ALL EXPENSES PAID!

1st and 2nd Prizes will be 2 Free Round Trips via the American Airlines Flagship and will include free hotel accommodations, meals and transportation necessary to reach airports, Hollywood and the M-G-M Studios and return.

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A magnificent radio machine has been contributed by the internationally-known Pilot Radio Corporation. It will constitute a Third Prize to be awarded in this National "Test Pilot" Essay Contest.

Judges for the National "Test Pilot" Essay Contest Are

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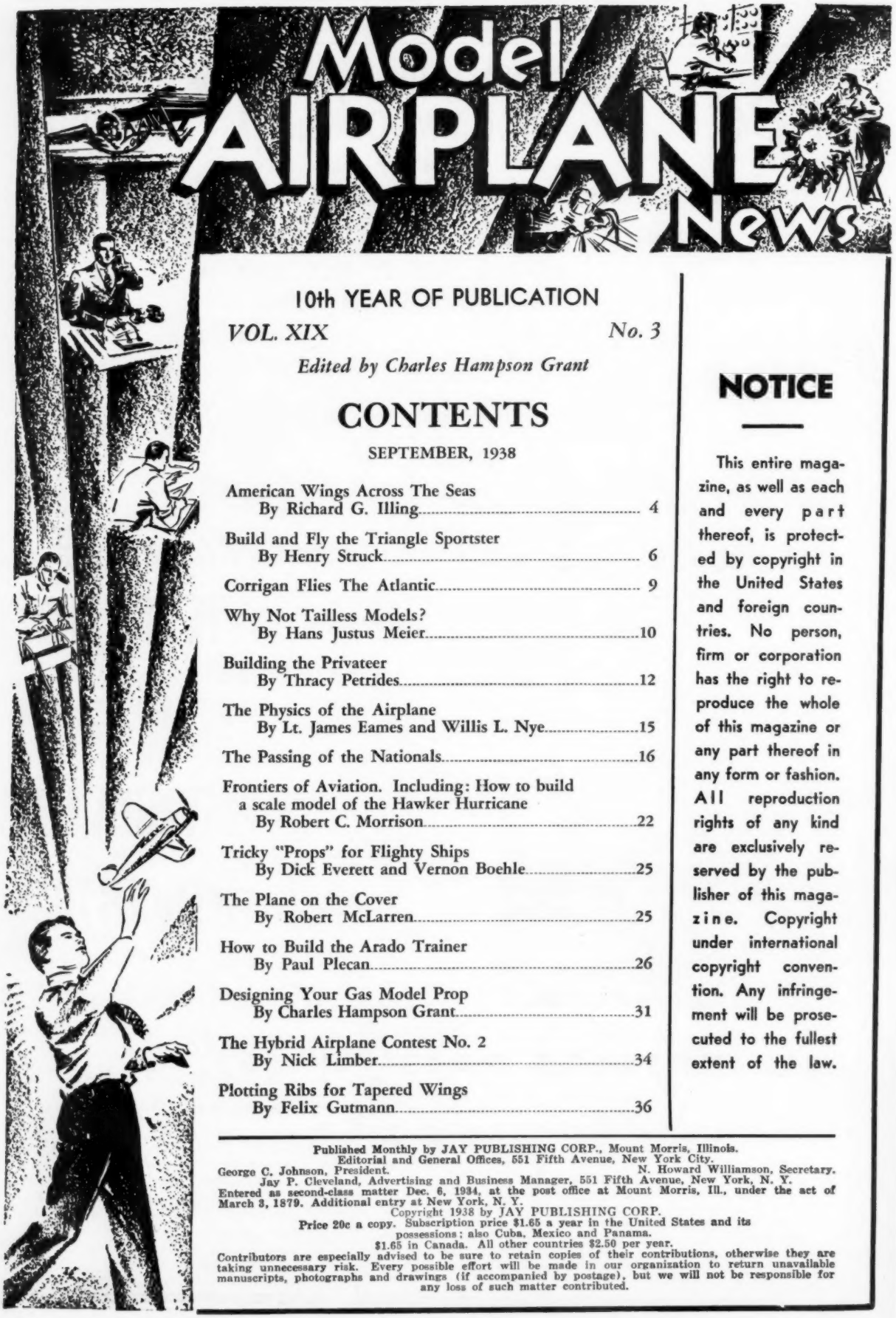
10th YEAR OF PUBLICATION

VOL. XIX *No. 3*

Edited by Charles Hampson Grant

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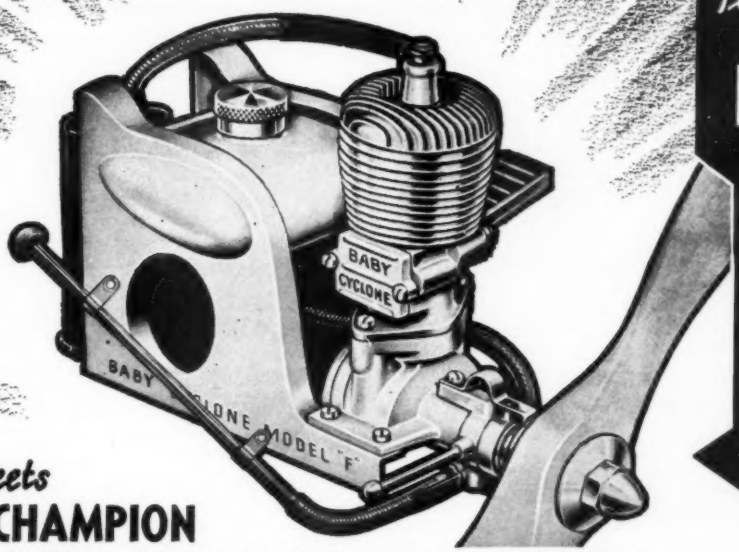

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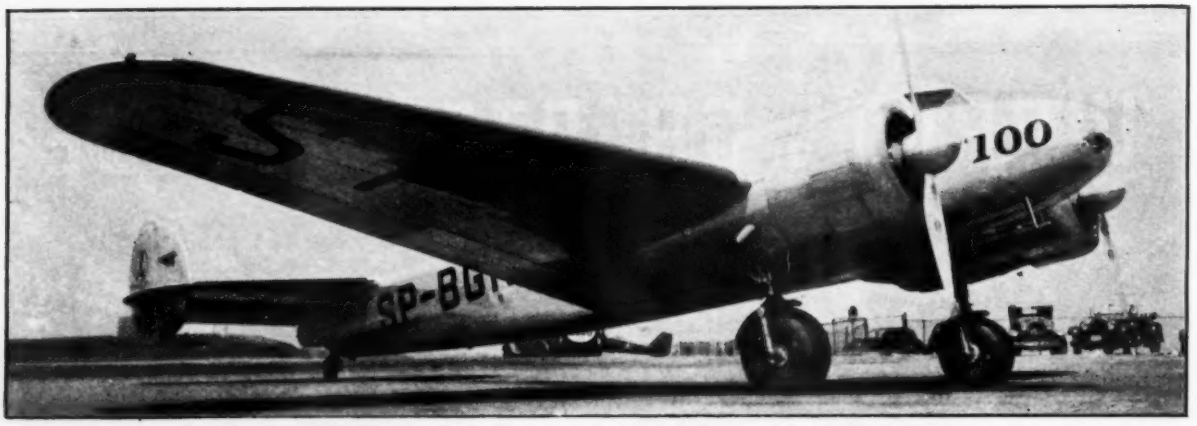


This is the 100th Lockheed Electra manufactured. It went to L.O.T. Airlines in Poland.

American Wings Across The Seas

What Happens to American Made Planes From The Moment They Leave the Factories Until They Are Poised for Their First Flight from Foreign Soil

By RICHARD G. ILLING

TIME and a technicality thwarted Congress in a race to stop a shipment of American planes to the Spanish front in January, 1937. Eight planes were crated at New York and loaded aboard the Loyalist freighter "S.S. Mar Cantabrico." The ship sailed, but was stopped off Sandy Hook by a U.S. Coast Guard cutter. Less than an hour later the cutter released the freighter because government lawyers had decided that the writ of attachment they had was insufficient. Fifty minutes later Congress adopted a joint resolution designed to prevent such shipments. But it was too late. That incident was one of the few times that the public was interested in aviation exports.

This Rearwin trainer was sent to Sweden.

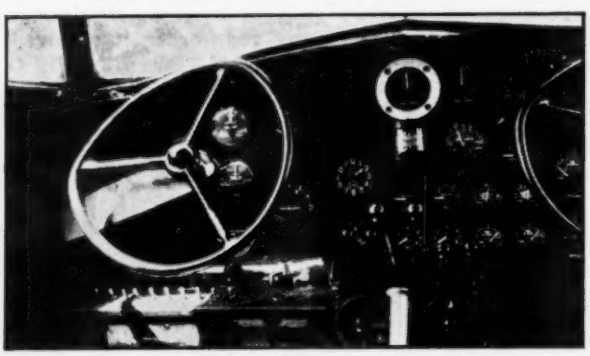
We all know about the excellent record that American airplanes are making in the service of foreign nations. Among them, the Douglases and Lockheeds are flying thousands of miles, proving the superiority of our aircraft. But what happens between the time one of these planes is built and the time when it goes into foreign service? Did you ever stop for a moment to think how they get to Holland, Sweden, England and the other nations?

That procedure is one of the most interesting in the aviation industry. Let us visualize one of these planes in a routine trip from the factory. For purposes of our story it is a Douglas DC-3 for Swissair in Switzerland, bearing the identification letters HB-IRA.

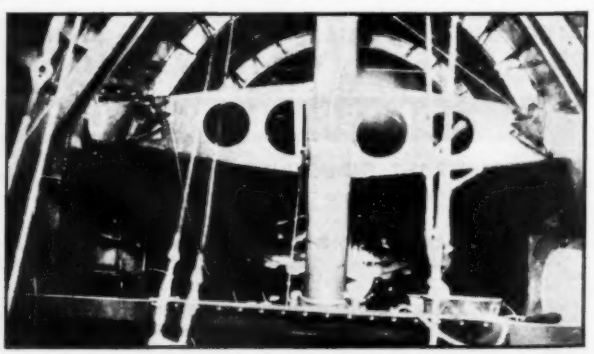
On July 1st, with a thundering roar of its twin 1,000 HP. Cyclones, the trim airliner speeds down the runway at Santa Monica and quickly gains altitude. Its nose then points eastward and it is off for Europe—via steamship. On board are the pilot and his father and the co-pilot and a friend of his, as well as two company men bound for New York City.

Three days later our ship is only at Columbus, Ohio; a heavy fog at Kansas

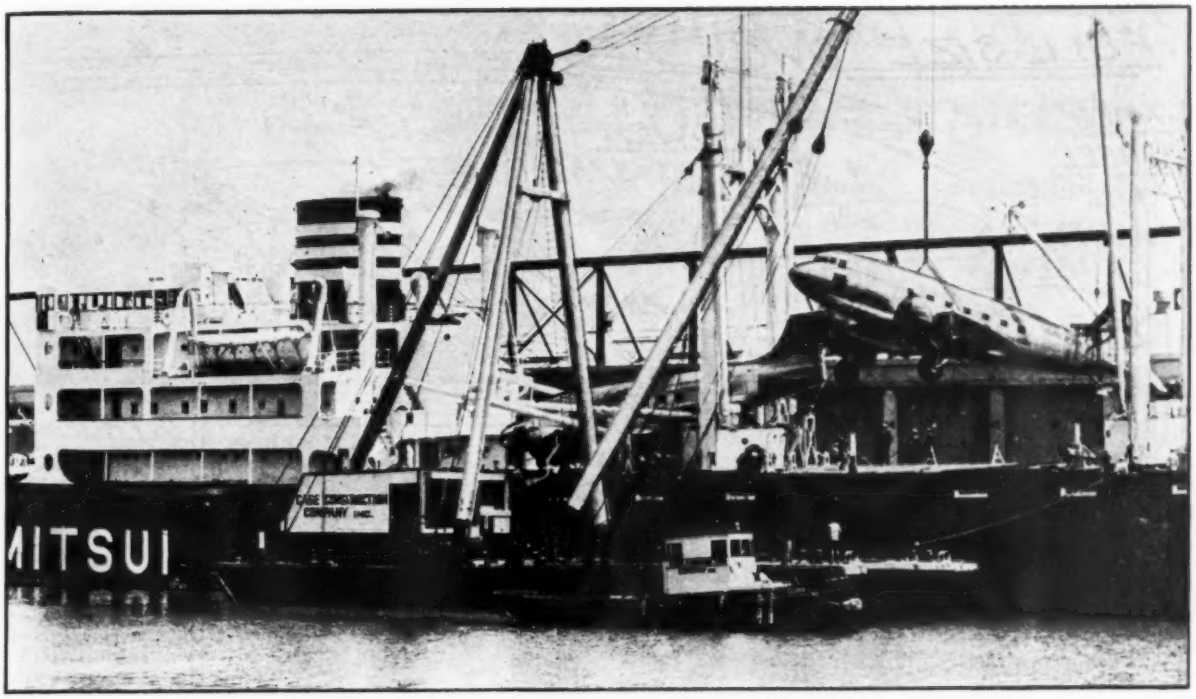
A Lockheed 10-A that now flies on Czechoslovakian Airlines.



Here is a closeup of the instrument Board in a Lockheed Electra that was shipped to I.A.R. Airlines in Roumania.



Interior of a DC-3 baggage compartment showing control cables disconnected and tied to prevent tangling.

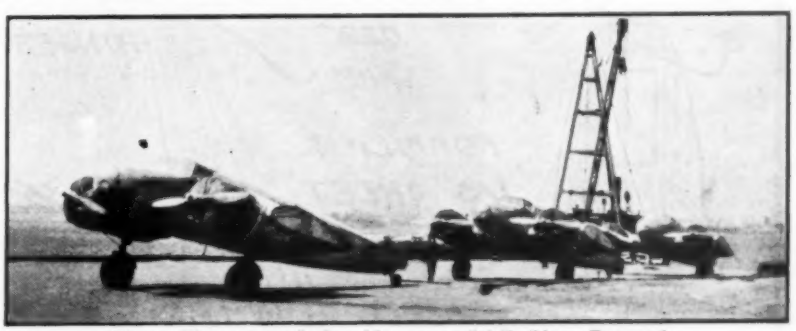


Douglas Transports being loaded on a ship at Los Angeles, for a journey to Japan.

City kept it grounded for a day and a half. As these planes are not run on a schedule they do not fly when adverse weather conditions prevail. Even with ideal conditions they make a two or three day trip of it.

At about four o'clock on July 5th the DC-3 drones over North Beach Airport in New York City at about a thousand feet. The wheels are down already as the sleek, silver colored airliner with its gleaming red tail starts a sweeping circle of the airport over Flushing Bay. (Swissair ships have a red rudder and fin with a large white cross.) The flaps slowly come down and in a minute the ship is rolling towards the hangars. When a mechanic waves the ship between two hangars the pilot slips it through the narrow space with the speed and skill of an expert. The plane pivots on one wheel and comes to a sudden stop behind hangar number one.

While the passengers and their luggage are being cared for, several mechanics quickly place two or three oil drums under the ship and drain the gas. The co-pilot is busy in the cockpit disconnecting the giro-pilot. This costly instrument is returned to the factory to be used in another ferrying trip. When the gas is all drained out of the tank, the gas truck drives up and puts twenty-five gallons of 73 octane gas



Three "Electras" ready for shipment to I.A.R. Lines, Roumania.

in the right main tank. The pilot hops back into the cockpit and blows the engines until the gas tank is again dry. The oil is then drained and the ship is chocked up and lashed to the ground. A glance into the hangar shows us why it is left outside. The hangar is filled up with ships; three dismantled Electras for L.O.T. in Poland stand on one side with their dismal coats of grease, as well as a Rearwin Sportster for Sweden, several Vultees, and a DC-3 yet to be dismantled.

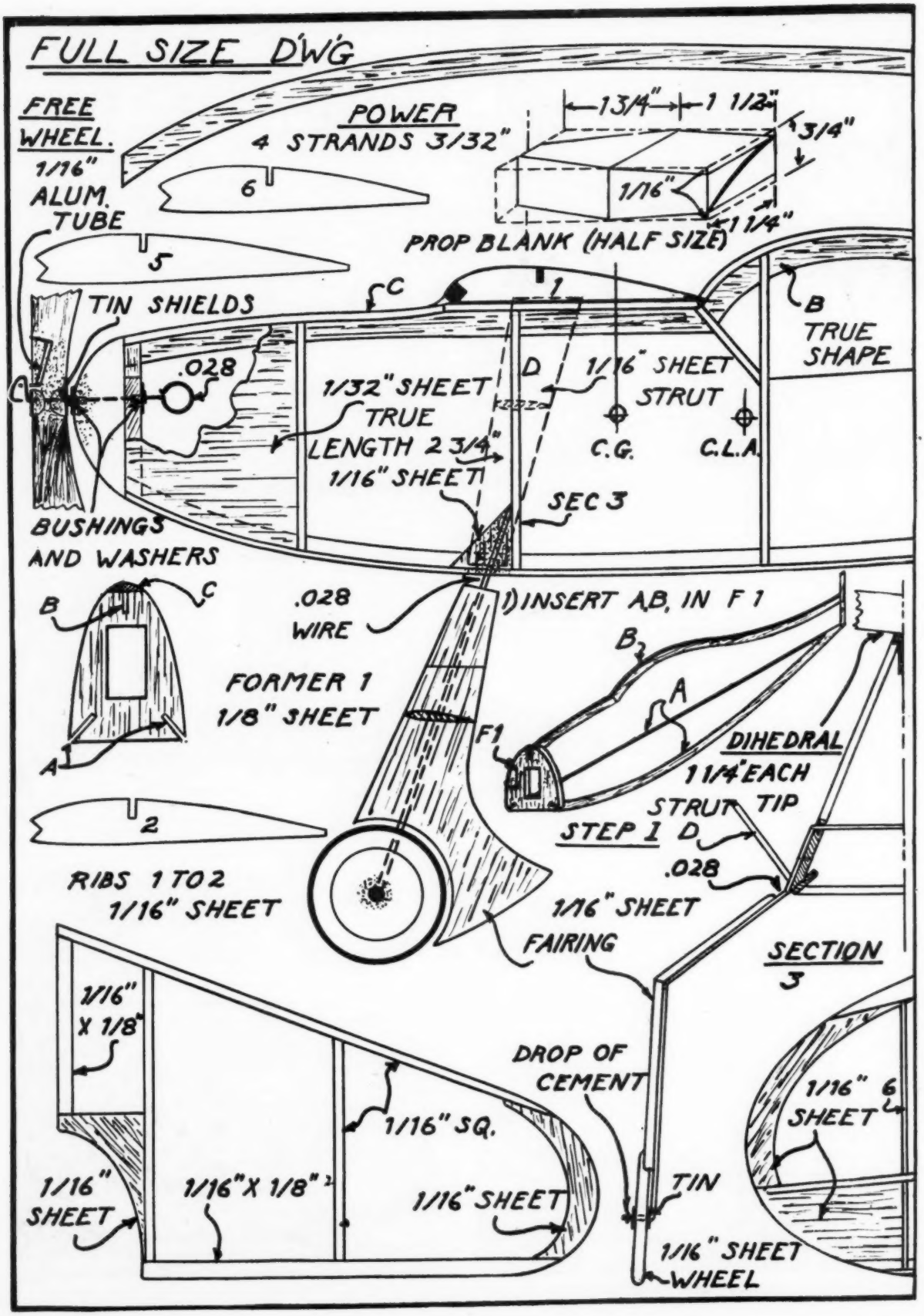
Three days later our plane is hauled into the hangar by the sputtering old tractor. Then we begin work in earnest. A half dozen mechanics grab mops and rags with pails of gas or cleaning fluid and wipe down the whole ship until, even in the shade of the hangar, it shines brightly. It seems like a living thing, proud of itself; especially as several small boys come slowly sneaking into the hangar and gaze at it and make comments.

While four mechanics remove the ailerons, the rest of us are busily engaged disconnecting the navigation lights, radio antenna, and control wires; removing the rear control surfaces. When the time comes to remove the stabilizer, the smallest

(Continued on page 40)

One of the latest twin engine Grumman Amphibians which was sent half way around the world to Australia.

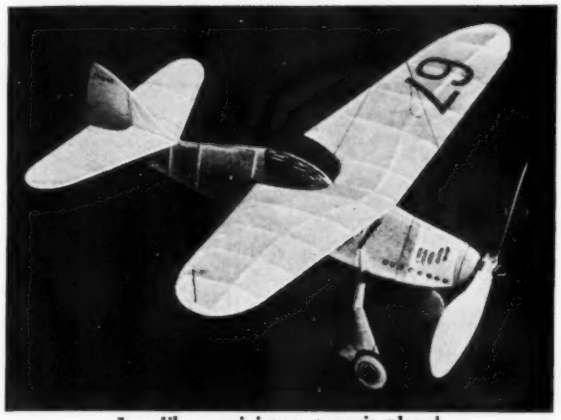
A Douglas DC-3 transport being prepared for shipment to "Swissair" Air Lines, Switzerland. Note the foreign markings.


FULL SIZE D'WG
FREE WHEEL. 1/16" ALUM. TUBE
POWER
4 STRANDS 3/32"
13/4"
1 1/2"
3/4"
1/16"
1 1/4"
PROP BLANK (HALF SIZE)
6
5
TIN SHIELDS
C
1
B
TRUE SHAPE
.028
1/32" SHEET
TRUE LENGTH 2 3/4"
1/16" SHEET
D
1/16" SHEET
STRUT
C.G.
C.L.A.
SEC 3
BUSHINGS AND WASHERS
B
C
A
.028 WIRE
FORMER 1
1/8" SHEET
1) INSERT A,B, IN F 1
B2
A
F1
DIHEDRAL
1 1/4" EACH
STRUT TIP
STEP 1
D
.028
2
RIBS 1 TO 2
1/16" SHEET
1/16" SHEET
FAIRING
SECTION 3
1/16" X 1/8"
DROP OF CEMENT
1/16" SQ.
1/16" SHEET
1/16" X 1/8"
1/16" SHEET
TIN
1/16" SHEET
WHEEL
6
1/16" SHEET

Build and Fly the Triangle Sportster

An Easily Constructed Unique Semi-Scale Flier of Striking Appearance That Turns in Consistent High Performance

By HENRY STRUCK

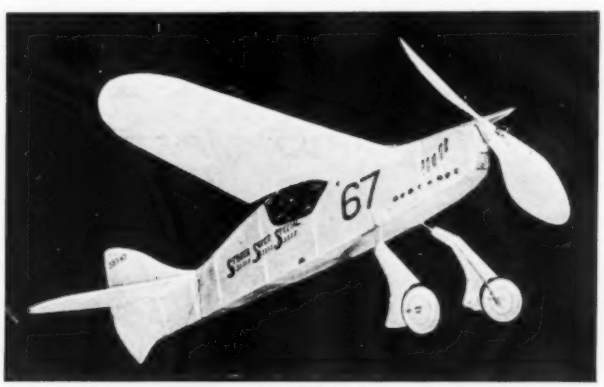


Just like a miniature pursuit plane!

THE sport model is one of the most neglected model airplane types. This is a strange situation as a great many builders are not primarily concerned with contest flying, but participate in the hobby for the sheer pleasure to be found in building and flying airplane models.

Bound by no set rules of weight and size, the variety of designs, combining simplified real ship lines and good stability principles, is practically unlimited.

As an example of what can be done in this field the "Triangle Sportster" was designed. The construction is exceedingly light, yet very strong. The inverted triangle fuselage conveys the basic idea of a racy ship, powered by an inverted "Vee" type engine. In the force set-up, the centers of gravity and lateral area, as well as the thrust line are properly located for inherent stability.



Excellent proportions and rakish lines give thrilling flights.

The promise of these principles was fulfilled by the long and outstanding performance of the original ship. No offset thrust of any kind was necessary, even though the climb was very swift and steep, with a fairly small circle against the torque. Flown in a large armory a duration of one minute, fifteen seconds was attained. When taken outdoors and tested in both windy and calm weather, unusual buoyancy and stability were exhibited, resulting in many soaring flights.

Full size plans detailing the simple construction used, make it possible to complete this flier in a remarkably short time. For maximum strength and lightness it is advisable to use the "quarter-grain" variety of balsa (speckled appearance).

Fuselage

The fuselage consists of three longerons cut of 1/16" sheet balsa. The true shape of A is traced from the pattern at the top of the plan, while B may be taken directly from the side view. Cement the longerons into the nose former F-1, cut from 1/8" sheet balsa. The rudder post of 1/16" square is next glued in place. Check the alignment of this assembly very carefully.

Former F-7 is cut of 1/16" sheet balsa and the rear hook, bent of .028 piano wire, is cemented securely to it. Fit the bottom cross pieces in place. The uprights are laid in position and allowed to project above the top longerons. After they are set the excess length is trimmed off.

A 1/16" x 1/4" cap strip, C, is cemented to the top longeron and sandpapered to round off the corner of the fuselage neatly. The first panels of the fuselage sides are filled in with 1/32" sheet and small triangular re-enforcements are cemented at section 3.

Cut the rudder outlines from 1/16" sheet, tracing their shape from the plan and build up the rudder frame directly on the rear of the body.

Landing Gear

The foundation of the landing gear is bent of a single length of .028 piano wire nine inches long, to the shape shown in the front view of section 3, and then cement solidly to the reinforcements provided. Fairings are cut of 1/16" sheet, sanded to a streamline section and cemented to the wire only. The space between the fuselage and the fairing allows the wire to flex and absorb the shock of landings. The wheels are cut of 1/16" sheet with tin bearings, or washers, glued to both sides and are retained on the axle by a large drop of cement.

Surfaces

Cut two ribs each of numbers 3 to 6, of 1/32" sheet; two of number 2, of 1/16" sheet; and one of number 1 also of 1/16" sheet. Trace their shape from the full size templates given. Pin the 1/8" square leading edge to the work board and cement ribs 3 and 6 to it. The trailing edge of 1/16" x 1/4" is glued against the ribs and the curved portions of the wing outline added. Fit the remaining ribs and the spar in place. Crack the wing at the center and raise each wing tip 1-1/4" for dihedral.

The stabilizer is flat in section and is simple to build up of 1/16" thick stock.

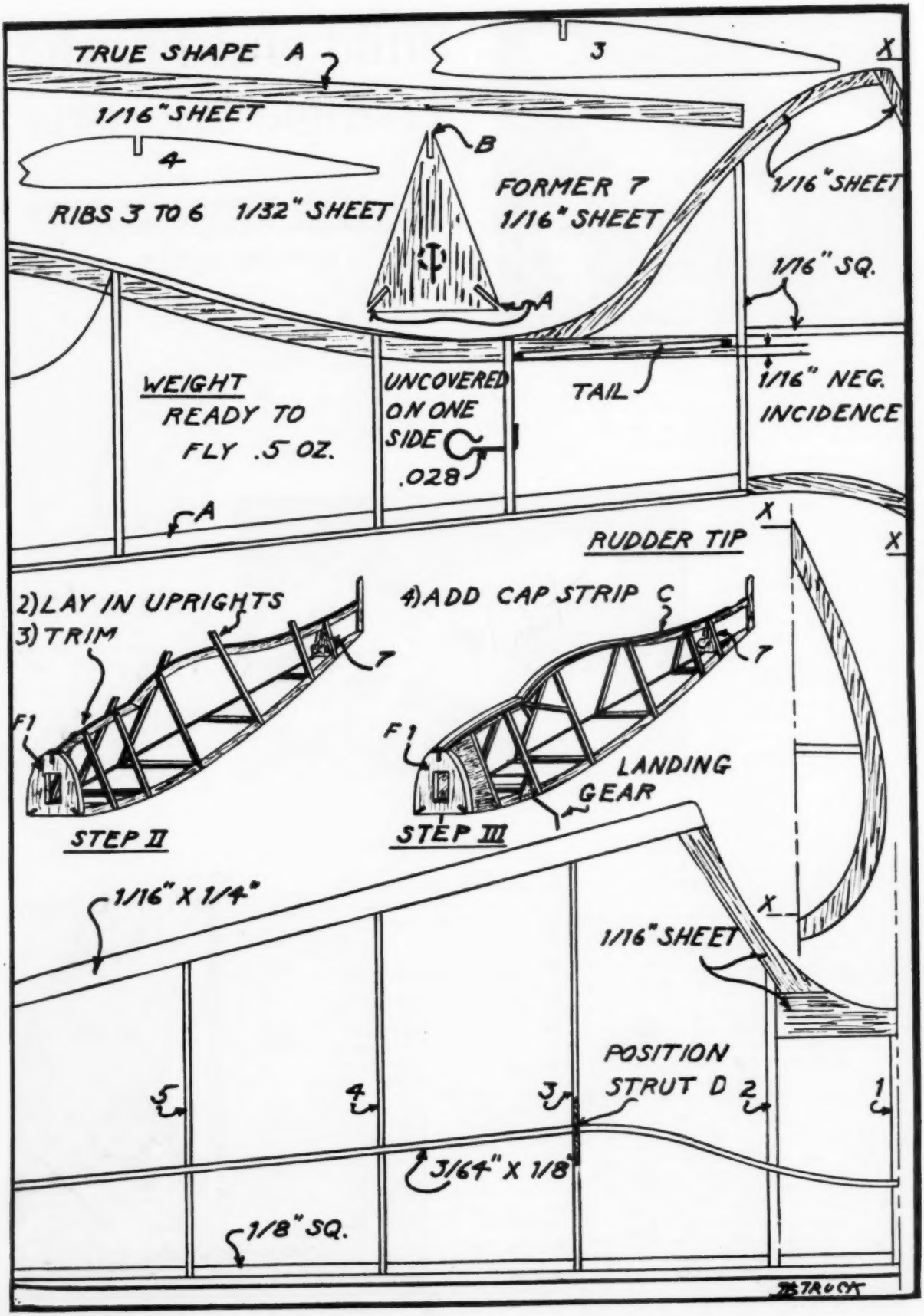
Nose Block and Propeller

The nose block is shaped (with a knife) from a block 3/8" x 1" x 1-1/4" and sandpapered to meet the contours of the nose smoothly. The plug portion is made of 1/8" sheet, preferably the piece cut from the inside of former F-1, and cemented to the nose block. With the nose block in place drill a hole for the prop shaft. Cement the bearings, consisting of washers with bushings inserted, to the front and rear of the nose block.

The propeller is of a wide-bladed type

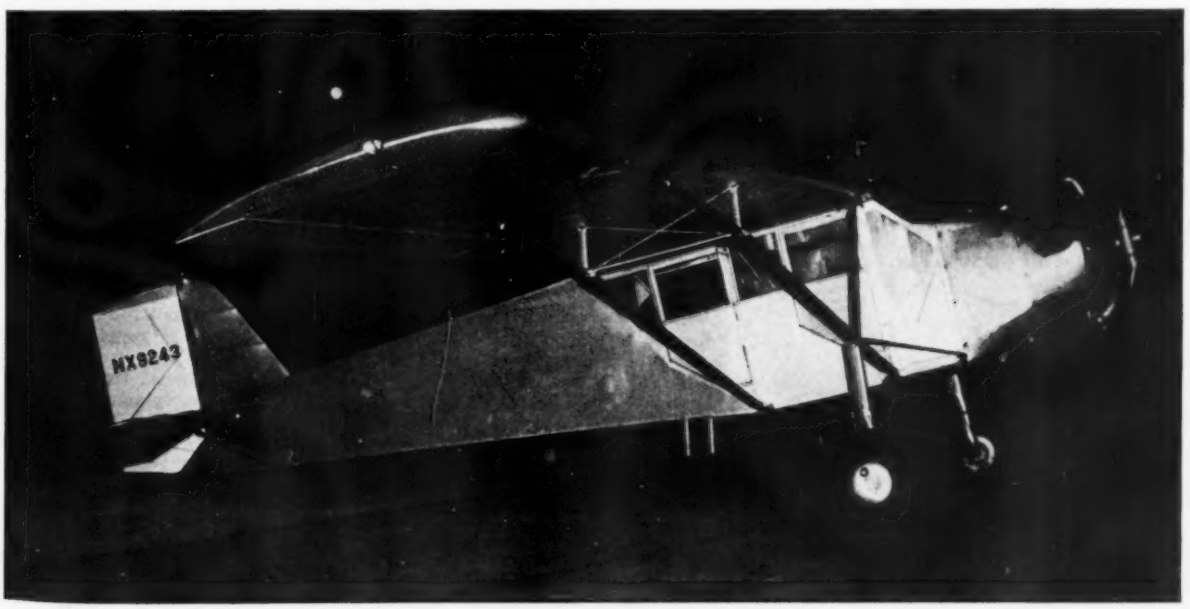
(Continued on page 48)

There is hesitation when this ship takes off.


TRUE SHAPE A
3
X
1/16" SHEET
4
B
RIBS 3 TO 6 1/32" SHEET
FORMER 7
1/16" SHEET
1/16" SHEET
1/16" SQ.
A
WEIGHT
READY TO
FLY .5 OZ.
UNCOVERED
ON ONE
SIDE
.028
TAIL
1/16" NEG.
INCIDENCE
A
RUDDER TIP
X
X
2) LAY IN UPRIGHTS
3) TRIM
4) ADD CAP STRIP C
7
7
F1
F1
LANDING
GEAR
STEP II
STEP III
1/16" X 1/4"
X
1/16" SHEET
POSITION
STRUT D
5
4
3
2
1
3/64" X 1/8"
1/8" SQ.
BETRUCK

Corrigan Flies the Atlantic

Douglas T. Corrigan, thirty-one year old mechanic and pilot, standing beside his $900 Curtiss Robin in which he flew solo, non-stop, from Roosevelt Field, Long Island, to Dublin, Ireland, July 9th. He covered the distance, 2400 miles, in 27 hours, 50 minutes; using only 250 gallons of gasoline. The picture above was taken just after he arrived at Roosevelt Field, having flown 2700 miles non-stop from Los Angeles, Calif. The picture below is a rare shot taken at the actual moment Corrigan's ship started from rest on his take-off for what eventually proved to be Ireland, though he told officials that his destination was California. He repelled the attacks of hunger and thirst on the flight merely with a quart of water and half a chocolate bar.

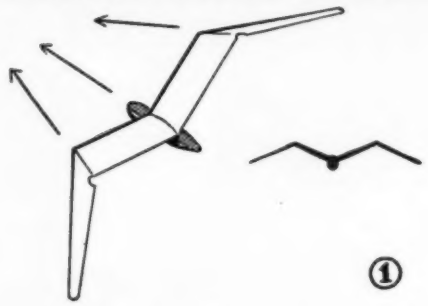


A "Flying Plank" by Hans Adenaw. Note inverted airfoil in outer panels.

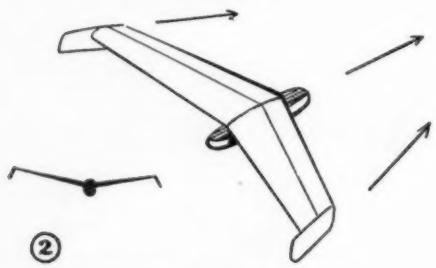
Why Not Tailless Models?

The Story of the Development of Tailless Airplanes in Germany and What Has Been Learned From Untiring Experimentation.

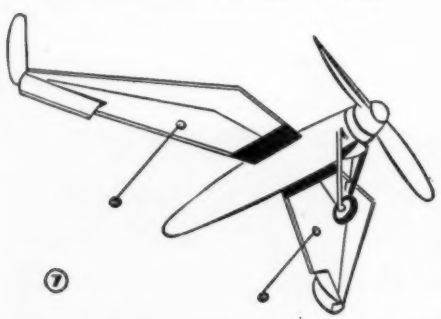
By HANS JUSTUS MEIER



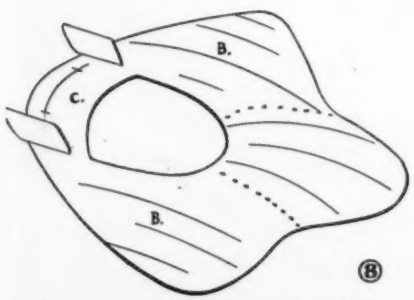
"Weltensegler" of Mr. Wenck, 1921. Note absence of rudders.



The "stork" of Mr. Lippisch, 1922.



The tailless rubber powered model of Mr. Goodsir, England. Monocoque fuselage, midwing. Note slot for adjustment of wing.



Mr. Antes' project of a tailless machine.

SOMETHING about the development of these interesting crates and some hints how to handle them.

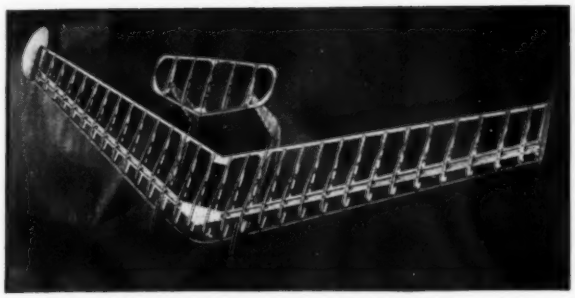
One of the most interesting types of models to be built is, no doubt, the tailless model and it is really astonishing to what little extent it is used in U.S.A. In my opinion this can only be explained by the fact that the theoretical suppositions for these models have been scarcely discussed up to now. Therefore I should like to bring some light into this affair by writing about its development in Germany and shall therewith show you what means have been employed by the different modelbuilders in order to solve the problems of stability around all axis. Also the advice added at the end of this little essay will give the interested reader some useful hints for the first test flights and a more successful working.

So far as I know, one of the first Germans that operated successfully with the tailless model was Dr. Geest. It was not later than 1896 that he made his first experiments based on observations of birds of prey, and he succeeded so as to take—in 1906—a patent for "a wing for airplanes, bent outwards from within, and around a slightly S-shaped line, so that the inner part of it has a positive, and the outer panel a negative angle of incidence to the direction of flight." Later (before and during the "Great War") he constructed military airplanes that had very good stability in gusts and an excellent gliding angle. Then his efforts rested for a long time and it was not before 1935-36 that Horst Winkler—one of our aces, if not the best of them—flew two models constructed according to the ideas of Dr. Geest. Both distinguished themselves by soaring higher and higher and by long distance flights; their flying abilities were surely good.

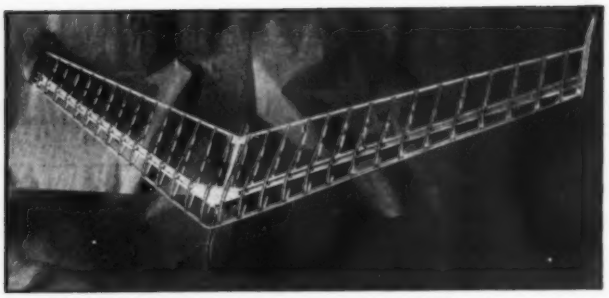
Geest demands three qualities of an actually "stable wing." 1) The angle of incidence must vary in the different sections. 2) The larger angles must be inside, the smaller ones outside. 3) It is preferable that the difference between the largest and the smallest angle of incidence amounts to a certain number of degrees. The positives averaging at least 2.5 degrees, the negatives having an extreme of (—6) degrees. The latter gets no pressure from above, if a suited profile is employed.

Naturally all experiments of model builders were considerably interrupted by the "Great War." It was in 1921 that for the first time another model builder came through with a suitable design. Its prototype was, like Geest's models, the bird; in this case it was the gull that inspired him. Wenck, the constructor, tried to avoid the use of rudders, as he believed in getting sufficient directional stability only by means of a suitable position of the wing panels to each other. The inner wing of even chord had a little negative sweepback and large dihedral. The profile employed in this inner part was only slightly vaulted but had not a fixed centre of pressure. The outer panels had a sweepback of nearly 30 degrees and were longer than the central part. They had, in contrary to the middle section, negative dihedral, but the tips were placed a bit higher than the lowest point of the inner panel. In order to get a difference of the angle of incidence between the inner and the outer parts, the intersecting line (secant) was not parallel to the axis of flight but it was turned nearly 10 degrees to the nose. The profile in the outer panels was a symmetrical one with a fixed centre of pressure. The centre of gravity must have been in the first third of the wing depth. In spite of all measures the directional stability was not as good as had been expected by its constructor, but anyway it was a success inasmuch, as the model had excellent gliding and soaring abilities.

Already in the next year, 1922, a new model was produced, that approached the ideal very much. That was the so-called "Storch" (stork) of Mr. Lippisch. He procured sufficient directional stability by shrewing the profile from the inner to the outer side (by flattening the vault), and diminishing the angle of incidence by



A cross-breed between a normal and a tailless model.



A tailless machine of quite orthodox design. The shape of the airfoil can be seen very clearly.

These photos are published by courtesy of Messrs. Gebr. Heller, Schmalkalden, Germany.

nearly 10 degrees. The sweptback wing of monospar construction had very little dihedral and was inclined at its ends so that these tips stood diagonally outwards. Besides they were washed-out by nearly 3—5 degrees to the nose. The aerodynamical qualities of this model were so good, that they could scarcely be surpassed by any normal ship. You must especially regard that the dihedral of this type might only be a very slight one, when you wish to get good flying abilities.

In 1930 this model was succeeded by a design developed from it, that was the so-called "Delta"-wing, which was then presented for the first time on a tailless in the Rhoen. Seen from above it is a nearly triangular model with diagonally inclined endplates, which really are only a little snapped-off tip of the slightly dihedral wing—like its forerunner. Thus Mr. Lippisch used those endplates on this model too, that must extend beyond the wing tips. He had already tried them out on his "stork." But in contrast to the latter, the fuselage had been constructed like some sort of a keelfin in order to avoid lateral slips.

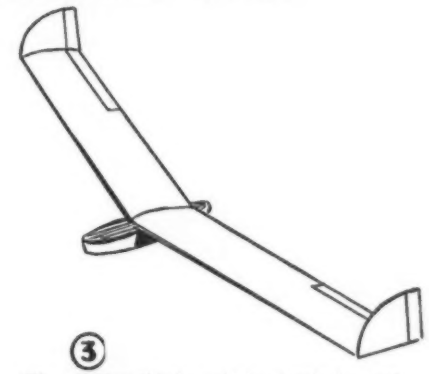
In the same year Lippisch brought forth another quite new form: the so-called "Fliegende Brett" which means in your language about the same as a "flying plank." This model was a monster as to size, the wingspan being 3.5 meter, and it had therefore to be launched from a special starting device. The straight wing did not show any wash-out or wash-in, dihedral was about 1:30. The wing tips had endplates again, slightly keeled forward. Lippisch gained directional stability by a symmetrical profile with a fixed centre of pressure. He employed a short solid streamline fuselage that granted a low position of the C.G. If you try to build such a crate, please note the following. The fuselage must form an angle of about 6-8 degrees to the wing, so that it must point slightly downwards when supported in the C.G. and the wing must only have little angle of incidence. The correct determination of the C.G. is mostly important: it lies nearly at 25% of the depth of the wing, possibly before that point, but never behind it. The flying abilities of this simple model are very good, but you can better them if you make ailerons and rudder movable, as the model answers very quickly to even minute adjustments.

One of the many designs developed from the flying plank later on, was the Schul-wing. This chap employed a section with a nearly fixed centre of pressure (Munck M-12) for the centre part of the wing and dihedraled the fan-like outer panels.

In the Rhoen competition 1933 Rans Adenaw was winner with his model "H.A.W.X." His ship had a weight of about 2.7 kg. and a wingspan of 3.020 mm., and as this size is rather unhandy, he had built the wing in three separate parts. The wing had little dihedral and sweepback.

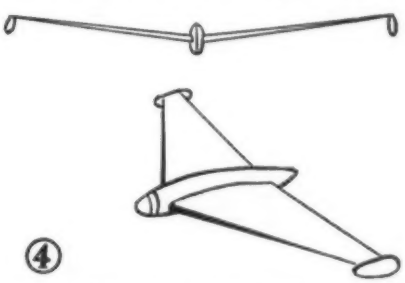
This model, too, strove for longitudinal stability by changing the profile (wash-out) in the following manner: the inner parts of the wing were vaulted flatly positive, the outer panels slightly negative. By the way, it is wrong to suppose, that the wing tips of this model possess the qualities of an elevator, for the wash-out or screwing here chiefly has the purpose of getting an accomodation to the elliptical distribution of lift, by hindering or at least retarding the break away of the airstream. But you will fail if you suppose that a bending high or down of the wing tips would compensate nose- or tailheaviness like an alteration of the angle of incidence on normal models; for the centre of pressure does not wander between different angles of incidence (mostly 2 to 8 degrees) in these profiles with a so-called fixed centre of pressure. According to this a bending of the wing ends is without any effect in this regard. Of course this would not be the case, if the wing would partly have airfoils with a normally moving centre of pressure. The wing of the H.A.W.X. is of twinspar construction with flat ribs, and the solid fuselage short but fairly streamlined. Upon the whole the model was a very

(Continued on page 59)



③

The "Flying Plank" of Mr. Lippisch, 1928.



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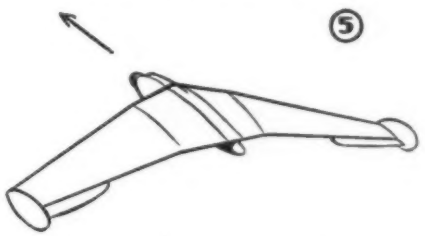
Delta wing, Rhoen 1930.



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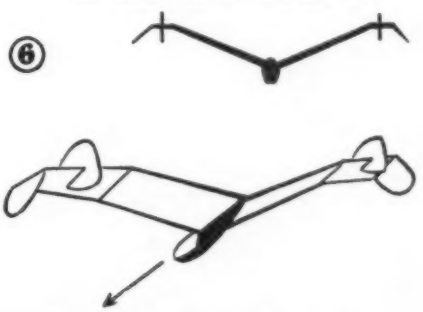
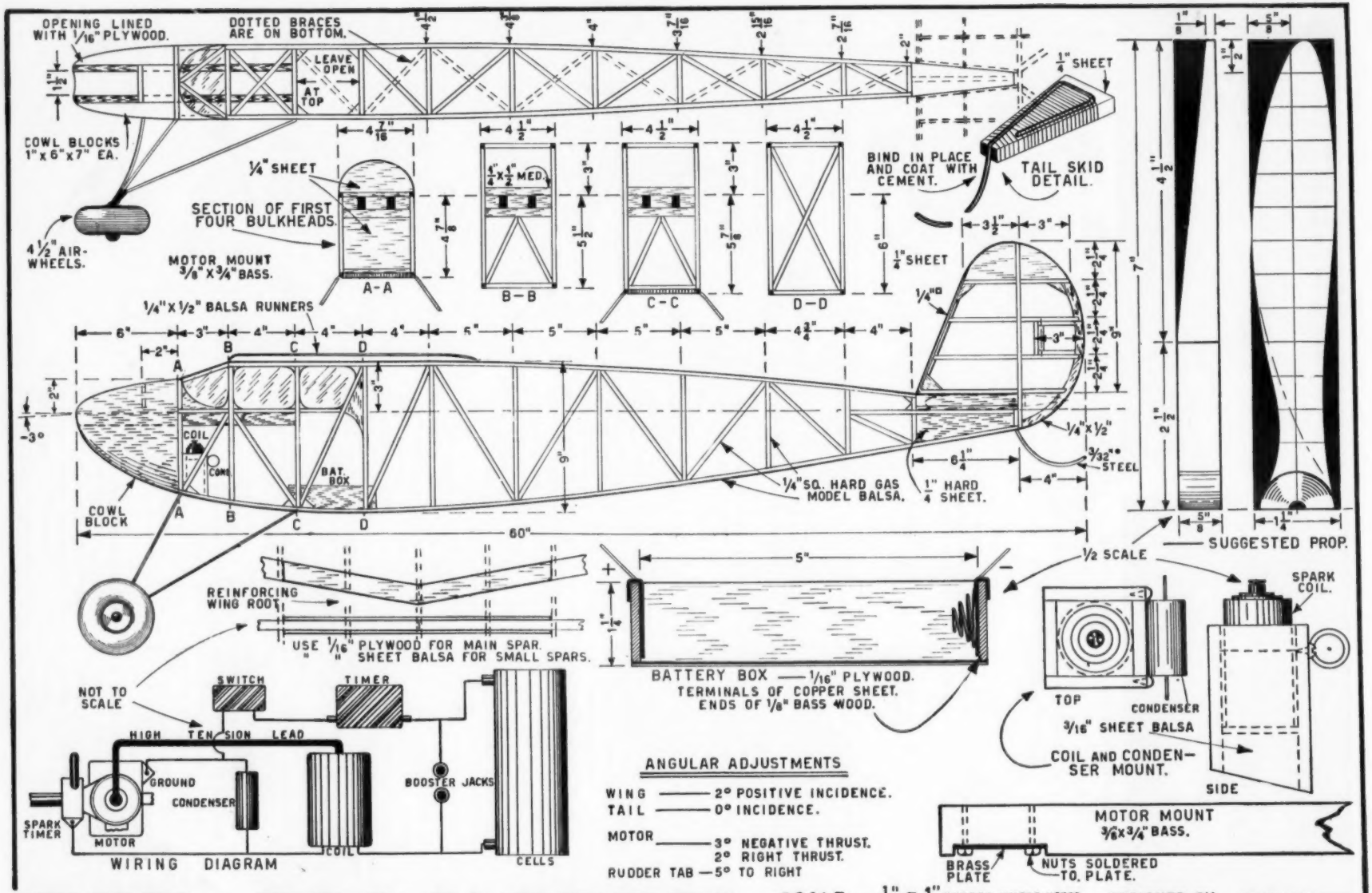
The "H.A.W.X." of Hans Adenaw.



⑥

The "Leipziger Flügel" Leipzig wing.

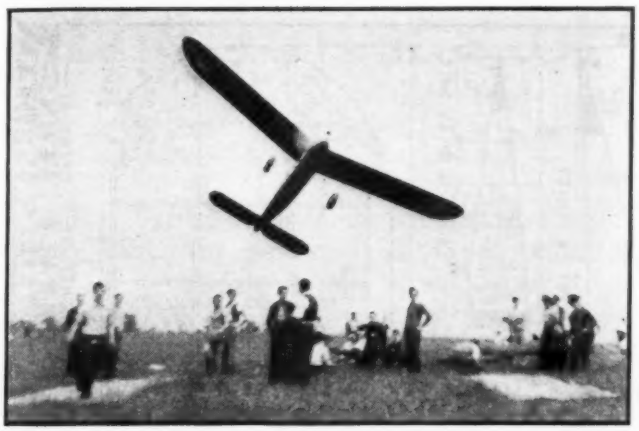


"THE PRIVATEER" • PLATE 2 •

SCALE — 1/8" = 1" EXCEPT WHERE NOTED.

DESIGNED BY— THRACY PETRIDES

DRAWN BY— FELIX GUIMANN



A perfect take off for a winning flight at Hadley Field.

Building The Privateer

How You Can Construct a Sturdy Gas Model That Has Proved to Be a Consistent Contest Winner

By THRACY PETRIDES

HERE is a superperformer without superconstruction! Not only does it embody the unusual simplicity of square construction, but it also retains the desirable flying characteristics of a streamlined plane. To substantiate this claim, it flew out of sight after 11 minutes, 25 seconds, at the 1937 National Meet at Detroit. And after being recovered, it later flew for 32 minutes, 50 seconds at another contest. During this flight it drifted only about a mile and at the end glided in for a perfect landing, a few feet from the followers.

From the very first flight the model showed signs of a promising future, and its excellent consistency may be attributed to the well arranged aerodynamic forces. The line of thrust is well up in the fuselage, placing it above the center of lateral area. This set-up promotes spiral stability, which is essential in a gas model. Successful endurance models have a tight spiral climb as well as a tight turn in the glide, the latter being necessary for soaring (the glide, of course, being as flat as possible), and this model incorporates these desirable features. The correct fin area makes possible the combining of these two flight characteristics. Two rudders were tested before the desired results were obtained. It is hard to believe that ten to fifteen square inches, more or less, in the rudder can make quite a noticeable difference, but these tests have shown this fact to be true.

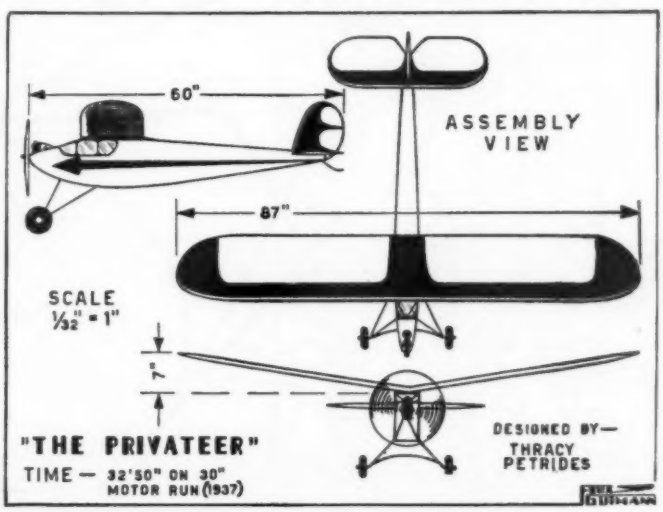
The wheels well forward prevents broken "props."

Construction

Wing

It is advisable to begin construction with the wing as this requires great care.

The rib shown is half the actual size, so it must be scaled up by plotting. Make a graph of half-inch squares on cardboard, plywood, or thin metal. Reproduce the section by making a small mark where the airfoil outline intersects each vertical station. Then connect the dots with drawing curves. Draw in the correct spar positions. When this is done cut out the template, and use it to make twenty-seven ribs on 1/8" medium balsa sheet. The builder may use his own favorite method of laying out the wing. All sizes of spars, etc., for the wing are noted on plate 1. The wing tips are 1/4" thick, being made by laminating 1/8" sheet balsa, and attaching them at a 45 degree angle. The method of joining the wing center section is clearly shown on plate 2. These center joints should be reinforced with heavy thread binding. The wing is covered with heavy bamboo paper. The gusset plates are of 1/4" sheet balsa and play a great part in preventing wing warpage. Notice the method of cap-stripping the wing with 1/16" medium sheet balsa.



Tail

The tail construction is similar to that of the wing. The tail mount perspective clearly shows how to assemble the rudder and elevator on the tail center block. The rudder section is symmetrical, and the ribs are of 1/8" sheet balsa.

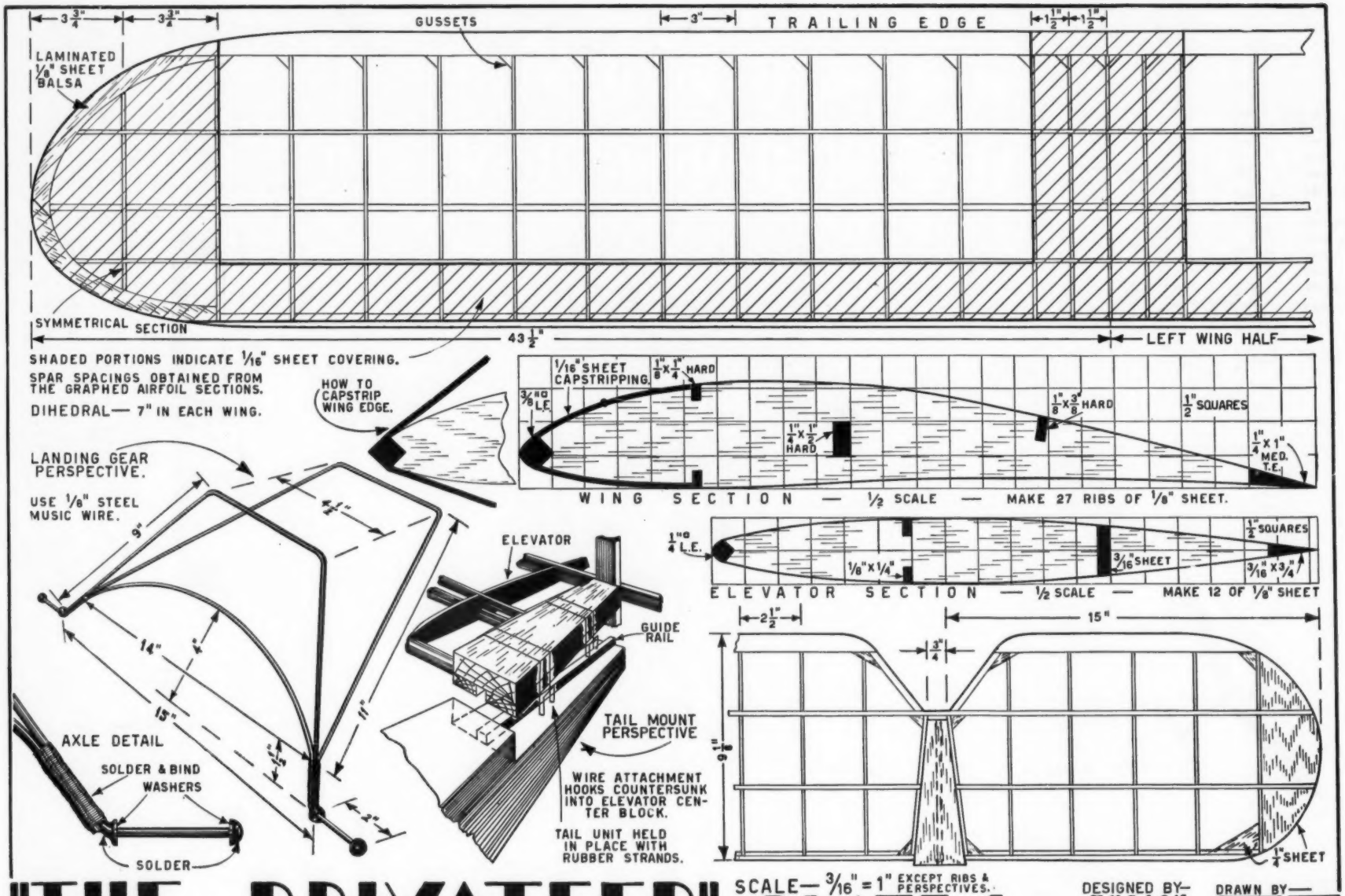
Fuselage

Obtain a piece of shelf paper 15" by 60" minimum. Draw the center line of the body so that when plotted it will be clear of the edges. Lay off the horizontal stations on this line, and through each point draw a light vertical guide line. Using a pair of dividers, get the length of each portion of each station above and below the center line, as shown on the drawing, and lay it off eight times on the corresponding guide line on the full size drawing. A proportional divider set to an eight to one ratio will save time if used here. When the side view is drawn up, it is mounted on a large board or table, and two fuselage sides constructed on it. The fuselage is finished in the orthodox manner. After the base motor runners are mounted in the plane, as shown in the drawing, two side cowl blocks are cemented in place securely. When the latter have been cut to approximate shape, the extraneous space is filled in with 3/8" sheet balsa. The landing gear is tied in place with heavy cord at stations A and C. Cover the body with bamboo paper. The inside of the cowling surrounding the motor is covered with 1/16" plywood. Two coats of dope are applied to the model.

Flying

The angular adjustments of the model should coincide with those on the table

(Continued on page 48)



"THE PRIVATEER" • PLATE 1 •

SCALE— 3/16" = 1" EXCEPT RIBS & PERSPECTIVES.

DESIGNED BY— THRACY PETRIDES

DRAWN BY— FELIX '35 GILMAN '36

The Physics of the Airplane

Complete Explanation of the Action of Physical Forces That Are Embodied in the Problem of Flight—Article No. 2

By LT. JAMES EAMES and WILLIS L. NYE

IN THE study of aeronautics we deal continuously with matter in its three fundamental states. It is the investigation of these characteristics, as they are applied to the subject of aeronautics, that we are immediately interested in. In a cursory examination of the three general states that matter exists in, it is difficult at first to ascertain just how these simple subjects tie in with aircraft. It is the purpose of this discussion to endeavor to illustrate this in a simple way.

The science of physics deals with the three general characteristic states of matter. These states are as follows:

(1) The solid.
(2) The gaseous.
(3) The liquid.

The first subject we deal with is solids. Now the structural materials that are employed in airplane construction must be solids by reason of their designated use. By definition: A solid substance is a material which can offer large resistance to forces of displacement that tend to distort the shape or profile, or rupture the fibers of the material. Such materials may be further sub-divided into the organic and the inorganic substances or materials. In airplane construction, the organic substances which are solid are spruce for wing spars, balsa wood for fairing use, mahogany as used in plywood, and a number of woods of lesser structural importance. Spruce is, by far, the most important because it has a very high strength-to-weight ratio combined with a good degree of stiffness, in comparison to its weight. The inorganic solids which are employed in airplane construction are aluminum, magnesium and steel. Aluminum is used extensively in the construction of all-metal aircraft. This material ranks first in the amount of tonnage that is utilized by the industry. Aluminum and its various derived alloys are used extensively as a skin cover for airplane frameworks because it has a good stiffness ratio in comparison to its weight. It is also used in bulk form such as in castings for various airplane fittings. The general disposition of aluminum alloys is such that the unit stress is at a low figure per square inch of surface. On the other hand, steel is used mainly as a material which must react to highly concentrated loads. In airplane work struts, axles, longerons and continuous frame members are made from steel. This material weighs three times as much as aluminum and when compared on a weight basis for stiffness, shows qualities inferior to aluminum. Therefore, to a large extent, the weight of a material predicates its application for some specific use in the airplane.

When we think of gaseous matter which is used in airplane operations, we immediately reconcile this to the state the fuel assumes in the process of combustion inside of the engine. In this case, the fuel is, of course, in its initial state a liquid which is carburetted, and then introduced into the combustion chamber of the cylinder of the engine. When gases are analyzed we find that they are capable of compression and expansion. Without these two characteristics, it would be impractical to use an internal combustion engine as we know it today. Now the gases after they are burned or consumed still represent a source of potential power. For instance, take the exhaust driven supercharger. This form of super-aspiration for internal combustion engines works more efficiently at high altitudes than the centrifugal types of superchargers. The exhaust gases also contribute to their worth by virtue of their use as a source of heating for the personnel in the cabin of the transport airplane. In other words, gases are a division of matter that can be effectively used during combustion.

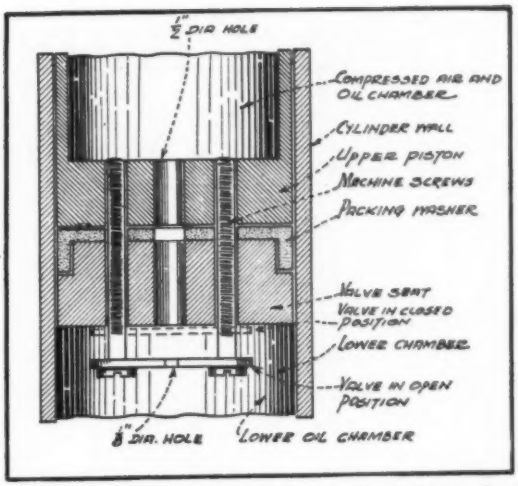


Fig. 1. Cross section of a typical oleo valve which makes use of the compressibility properties of gases and the viscosity of liquids.

And now it is our turn to discuss the part that liquids play in modern aeronautics. Just as gases are compressible, liquids are incompressible. This valuable characteristic makes the use of the hydraulic control of the braking possible, the operation of controls in many instances and the Sperry automatic pilot as well as the operation of oleo members in shock absorbers. Liquids have the ability to maintain a definite volume. The characteristic of the liquid is such that it assumes the shape of the container in which it is poured. The application of liquids to aeronautic use encompasses two general divisions of liquids.

When an analysis of the physical properties of a liquid is made, we find that some liquids are viscuous and some are not considered viscuous; although every liquid has a definite degree of viscosity no matter what its density is. This property of viscosity is highly valuable in mechanical devices. For instance, viscuous liquids are used to check the rebound in shock members of the chassis, to actuate the variation in the pitch of the propeller and to act as a dampening agent in certain of the flight instruments. Then it may be definitely established that viscosity is highly valuable as a property of liquids. See Fig. 1. This illustration is an example of a high viscosity liquid acting in conjunction with compressed air, which in this case is considered a gas, to relieve the airplane from severe shocks encountered during a landing. This is done by means of a mechanical device known as an oleo shock absorber.

Viscuous liquids are those which have an initially high surface tension. Oil is a viscuous substance or liquid. It is often heard that a certain oil retains its viscosity even when heated, thus making it a valuable

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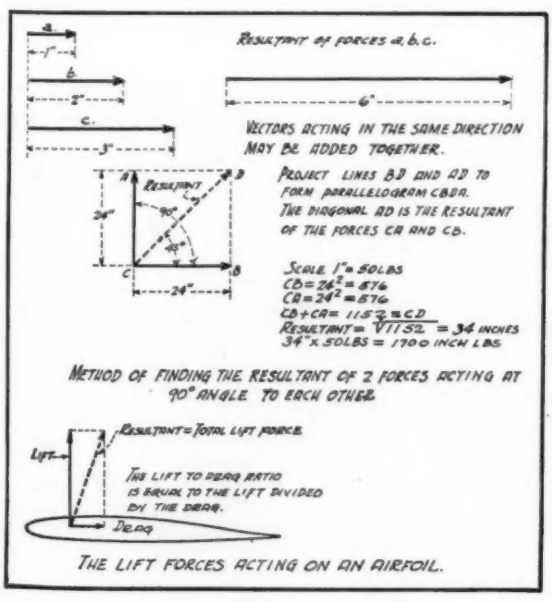

RESULTANT OF FORCES a, b, c.
a
1"
b
2"
6"
c
3"
VECTORS ACTING IN THE SAME DIRECTION MAY BE ADDED TOGETHER.
RESULTANT
PROJECT LINES BD AND AD TO FORM PARALLELOGRAM CBDA. THE DIAGONAL AD IS THE RESULTANT OF THE FORCES CA AND CD.
90°
45°
24"
24"
SCALE 1" = 50 LBS
CB = 24² = 576
CA = 24² = 576
CB + CA = 1152 = CD
RESULTANT = √1152 = 34 INCHES
34" X 50 LBS = 1700 INCH LBS.
METHOD OF FINDING THE RESULTANT OF 2 FORCES ACTING AT 90° ANGLE TO EACH OTHER.
RESULTANT = TOTAL LIFT FORCE.
LIFT
THE LIFT TO DRAG RATIO IS EQUAL TO THE LIFT DIVIDED BY THE DRAG.
DRAG
THE LIFT FORCES ACTING ON AN AIRFOIL.

Fig. 2. The resultant of simple forces.

The Passing of The "Nationals"

N.A.A. Junior Membership News

"Gas Lines" — Air Ways

Vivid Glimpses of the 11th Annual National Model Airplane Championship Contest Held at Detroit, July 6th to 9th, 1938

Winnie Davis' 13 ft. gull wing gas model in full flight.

THE 1938 National Model Airplane Contest, held at Detroit, Michigan, is now down the highway of time and is a thing of the past. To tell the details and give you a glimpse in words of the many interesting and instructive moments which resulted from the activity would take volumes of space. Obviously this is impossible. As pictures tell a more vivid and complete story than words, we have made this story of the Nationals a "picture story" rather than one of words. Nevertheless a few remarks may help to supplement the story which they tell.

Actually this contest, as far as the officials and public-spirited men who made it possible are concerned, started last fall. For eight months every detail of the contest was carefully prepared; this was evidenced in the smooth manner in which the meet progressed. As far as we could determine every contestant was very well satisfied with the operation. Without question it was one of the finest run meets that has ever been held.

In respect to the number of contestants entered, it was the largest—there were

Leo Bailey and the plane with which he won the outdoor senior class fusilage model event. He comes from Akron.

Robert Hoffmeyer who won the Mulvihill Trophy. The scoreboard displays the best times at any moment during the meet.

National champion, Milton Huguelot, with the Exchange Club and Bloomingdale Trophies.

Here is a sight that will dazzle you. Though it may look like the New York City skyline, it is merely the collection of trophies which was given to the winning contestants.

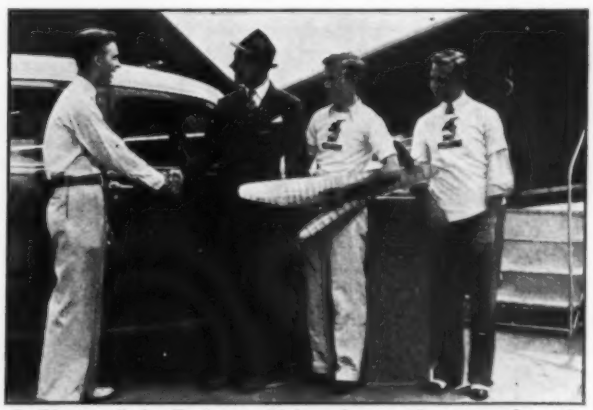
Walter Good and his winning radio control model of 8 ft. span. It weighs 7½ pounds complete with radio. Radio operator, Paul Kreelick, is at the left.

Walter Good with the R.C.A. radio and MODEL AIRPLANE NEWS Trophy which he won.

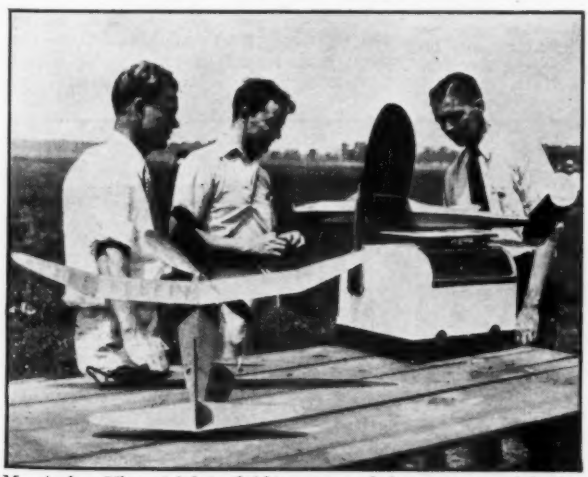
about 700 model builders registered in the various events. 400 of these entered gas models. This great event was made possible by the Exchange Club of Detroit and by the untiring labors of Mr. S. D. Eurich, its vice president. Nothing appeared to be too much trouble to him to make this meet a success. Mr. Irwin Polk was the business manager of the contest, and upon his shoulders rested the thousands of details in connection with the successful preparation and financial management of the contest. The latter was no small item, and a large amount of the funds that was required to run the meet was supplied by the generosity of the Detroit Exchange Club and its members.

The convention opened on Tuesday, July

Model builders in front of the Hotel Fort Shelby waiting to be transported to Wayne County Airport.



C. Pinnes of the Exchange Club welcomes the group from St. Louis as they step off the St. Louis plane to attend the Nationals.



Mr. Arthur Vhay (right), field manager of the contest, weighs in Frank Zaic's model which later won the outdoor cabin event, open class. Alan Booton looks on.

Here is the "cream of the crop" of indoor builders: Richard Obarski, Wallace Simmers, Mike Roll, Charles Belsky, James Cahill.

Grand champion Milton Huguelot and his model which won the indoor cabin event, sr. class.

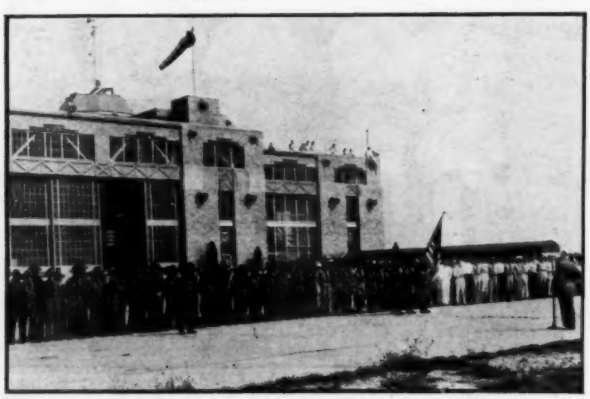
James Bohash with his Korda designed fuselage model, which earned him a place on the Wakefield team.

5th. On this day all contestants were supposed to register at meet headquarters, the second floor of the Hotel Fort Shelby. Though a large amount of space was set aside for the headquarters, in fact the whole mezzanine floor, it was difficult to wend one's way through the crowd of contestants which milled about the registration table. Even at this point it was evident that the contest would be successful. Everything went off smoothly and quietly, showing a well organized system had been established. One part of the mezzanine floor was set aside as an exhibition room. Here Megow, Comet, MODEL AIRPLANE NEWS and Syncro-Ace products exhibited some interesting features. Tuesday was an especially active day for the exhibition room, as it was about the only time the contestants had for getting together during the meet. The other days, Wednesday through Saturday, were occupied by various events which were run off at the Wayne County airport, about twenty miles outside of Detroit, and at the Grosse Ile hangar. At the latter the indoor events took place.

The contest was officially opened by the Mayor of Detroit, Richard W. Reading, on Wednesday morning at 10 A.M. This opening was initiated by the releasing of a rocket, which dropped, by parachute, an American flag from about 200 feet in the air. The contingent of soldiers from Selfridge Field had been trained by Mr. Arthur Vhay of the Recreation Department of Detroit. For some months previous Mr. Vhay had been preparing these men to fulfill these duties efficiently. These timers had charge of the various groups which were located and operated throughout the whole length of the field, and the main headquarters tent was within range of communication of all the groups. Here

Henry Struck and his beautiful little Caudron flying scale model which won him the trophy.

Clifford Hodge uses his head to save his legs at the contest. He has just retrieved a model after a flight.



The opening of the 1938 nationals. The mayor of Detroit addresses a group of the timers and officials.

Here is the Trenton contingent at the nationals. They purchased the bus with the proceeds of an air show which they held.

Arthur Beckington and his model which won the outdoor cabin event jr. class. It flew 31 minutes, 8 seconds.

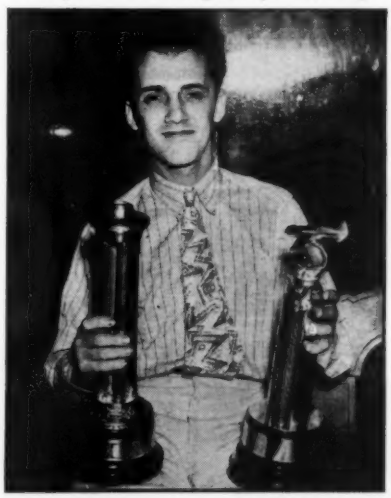
Builders from four corners of the model world meet to talk things over. Gordon Cain, Boston; Roy Lange, San Antonio; (standing) Charles Marcy, Syracuse, and Henry Velkoff, Fort Wayne.

the flight records were kept by a corp of diligent workers.

Mr. H. M. Jellison was the contest director and was responsible for the smooth manner in which the meet was conducted. Under his direct supervision was the headquarters staff. Among those composing this staff were: Mrs. Jellison, Mrs. Alexander and Miss Mildred Beckman, all of Akron. A group of recorders, under Mr. Vhay, operated a special system in which the times were assorted and pigeon-holed so that those who were winning could be determined at a moment's notice.

The events were smoothly carried out under the supervision of Mr. H. M. Jellison and Arthur J. Vhay, the latter in charge of operations. The Ford Motor Company provided bus transportation to and from the airport and the Chevrolet Motor Company provided 1,200 box lunches for the contestants. Commissioner C. E. Brewer of the Recreation Department in Detroit put at the disposal of the Contest Committee his entire model aviation department, the personnel of which made possible the smooth operation of the technical phase of the contest. Major Clagget of Selfridge Field provided more than forty uniformed men who acted as timers. On Friday all contestants were guests of Edgewater Amusement Park for a fun-fest which enabled them to relax, forgetting about models for the moment, and have a good time.

Many manufacturing companies, magazines and other concerns interested in the model field contributed to the success of the contest by donating prizes and cash.



Carl Goldberg with the Springfield and Flying Aces Trophies which he won.

Roy Nelder of Toronto, and the Moffett Trophy which he won.

Builders hard at work in the model workshop of the Fort Shelby garage.

A Canadian customs inspector looks over the models of Bert Norman of Vancouver, before he enters the United States.

A group of notables: Capt. A. Papana, famous Roumanian flier; H. D. Eurich, vice president of the Detroit Exchange Club; Milton Huguelot, winner of the 1938 National Model Plane Contest on the basis of points; Bill Enyart, secretary of the N.A.A.

Members of the Akron Model Airplane Club, which won the Megow Club Trophy: Leo Bailey (left center).

On Wednesday, the first day of the contest, the outdoor cabin model event and the Wakefield competition eliminations took place. The day was extremely warm and as it progressed a number of thermals developed. This made ideal flying weather. It is impossible to describe the activity and the many wonderful flights that occurred. The most interesting part of these events may only be registered by those who attended. Besides the flying during the four days of the contest, many model builders got together and discussed their problems. Without question this contributed to the ability of each individual to a very large extent, and to the general advancement of the art.

Outdoor Cabin Event

Arthur Beckington of Rockford, Illinois, won the William B. Stout trophy, and a $25 check together and a 400 mile air trip on the American Airlines. His time was 31 minutes, 3 seconds. Billy Riffel of Frontenac, Kansas, took second place and won the Hym and Kendall Trophy with a flight of 2 minutes, 30 seconds. The Casey

Model builders register at the indoor events.

Group No. 6 weighing in their ships.

Three more winners who took home the "hardware." Robert Hoffmeyer, winner in the outdoor stick event, sr. class; Leo Bailey who won first in the flying scale model contest and the outdoor cabin event, sr. class; and Arthur Beckington, first in the outdoor cabin event, jr. class, and second in the indoor stick event, jr. class.

Winners in three events: Howard Carlson who won second place in the open gas powered model event; Henry Struck who won first in the flying scale and first in the indoor cabin, open class events; Conrad Renning who won first in the outdoor stick event. Struck flew an exact scale model of a pre-war Candron.

The Canadian Moffett team. Top row: Milligen, Smith; bottom row: Anthony, Bower, Nelder, Watkins.

Here are the winners in the senior gas event: Ed Manthey, Bushner Derlick, Bob Taft. Standing, George S. Wheat, Jr.

Jones School of Aeronautics Trophy was won by Leo Bailey of Akron, Ohio, for placing first in the senior division with a time of 23 minutes, 35-4/5 seconds; while Kenneth Lane of Milwaukee, Wisconsin, was a close second with a time of 23 minutes, 29 seconds, and was awarded the Baker-Eberle Trophy. Frank Zaic of New York City placed first in the open class with a flight of 17 minutes, 6-1/5 seconds to receive the Switlik Parachute Company Trophy. Lavelle Walters of Windsor, Canada, won the Ellman and Kinnie Office Supply Company Trophy for a flight time of 8 minutes, 23 seconds. Henry Thomas of Akron won a MODEL AIRPLANE NEWS Plaque with a time of 8 minutes, 8 seconds.

The Wakefield competition eliminations proved to be a display of many unusual models. The official winner was Jim Cahill of Indianapolis, Indiana, with a time of 8 minutes, 11-1/2 seconds. Cahill won the contest with the same model he flew last year. Final results were:

Wakefield Eliminations Event

These entrants in the Wakefield event have been declared as the official team to represent America in the Wakefield contest, to be held in France during the latter part of the summer. By winning the event at the Nationals they received a MODEL AIRPLANE NEWS Plaque. The boys are: James Cahill, James Bohash, Jr., Detroit; George DeLaMater, Oneonta, New York; G. J. Wisniewski, Milwaukee; Henry Stiglmeier, Inglewood, California; William Pfeil, San Antonio, Texas. All but Stiglmeier and Pfeil sailed for France July 20th.

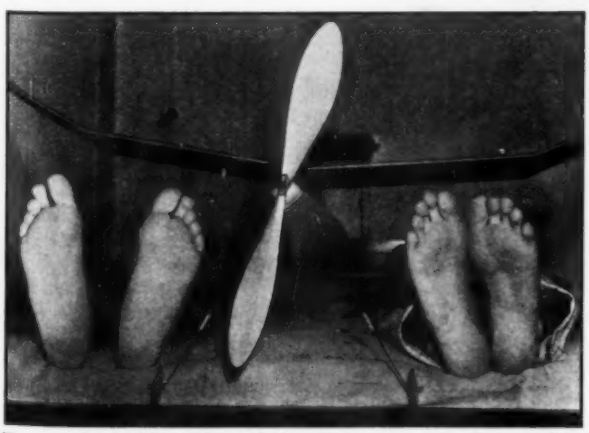
Moffett International Event

The winner of this event, with a time of 5 minutes, 17 seconds, was Roy Nelder of Toronto, Canada. He won the Admiral

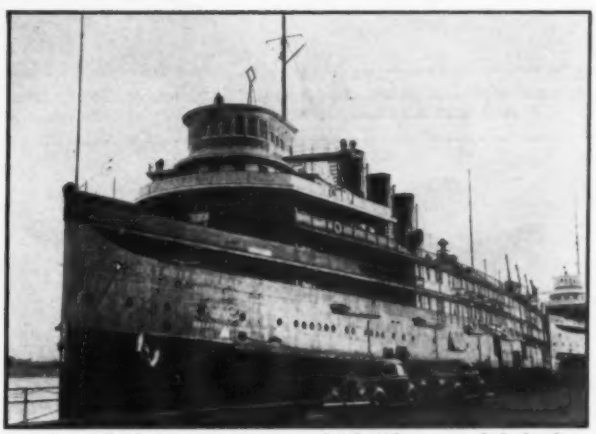
(Continued on page 49)

Mary Roll who was awarded the trophy of the Women's Aeronautic Assn. of Detroit for the most active woman model contestant.

Chester Wood, son of Gar Wood, congratulates Milton Kahn, winner of the gas powered model event, open class.



Two model builders "bare their soles" to protect their model from sabotage.



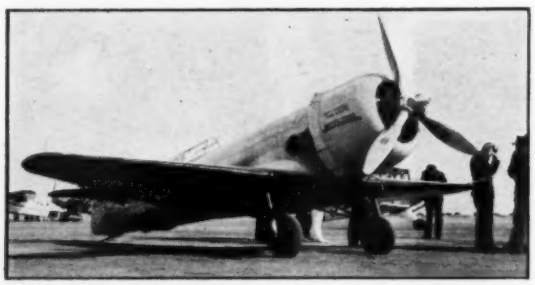
At the end of the contest 700 model builders attended the banquet which was held aboard this steamer.

Howard Hughes Lockheed Transport with which he circled the globe in 3 days 19 hours. (Acme)

Frontiers of Aviation

By ROBERT C. MORRISON

THAT was nice of England to order four hundred of our war planes. The English are sensible people with a mighty air power, and it is fortunate that we are on such friendly terms with them. We cannot say for sure, but things point towards the use of Allison engines in the 200 Lockheed bombers ordered by the British. The top speed may well pass 260 miles per hour, with a load of bombs, a crew of four, and four machine guns. The total cost of the bombers, a development of the Lockheed 14 transport, will be about $18,000,000 which is a good reason why Lockheed just took on fifty additional engineers. The papers say North American received the other half of the order, and rumors are that Douglas may get some of the English business.



Earl Ortman's Keith Rider racer that beat Detroyat's closed course record. (Morrison)

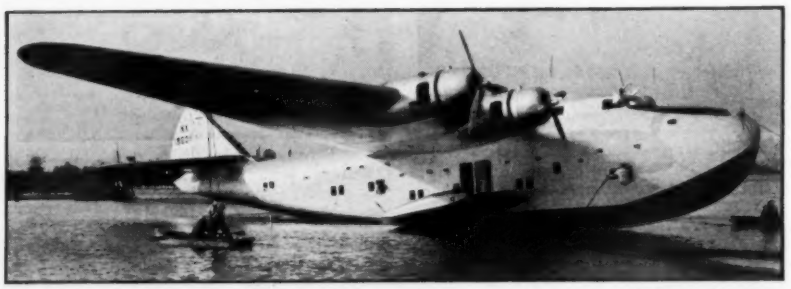
In the meantime Curtiss Wright gets busy on an order for the French government for 100 modified P-36 pursuit planes which may see their way to the Spanish war. Then Seversky received an order amounting to about $2,000,000 for their swift "envoy fighters" which may go to South America and then China. Several have been crated at one shop for shipping, while in a neighboring hangar several Lockheeds were packed for the Japanese cause.

Other export news is that Howard Hughes' Douglas DC-1, the very first of the famous Douglas twin-engined transports, has been shipped to England for Lord Arthur Forbes. Five new Douglases were also shipped to Japan recently.

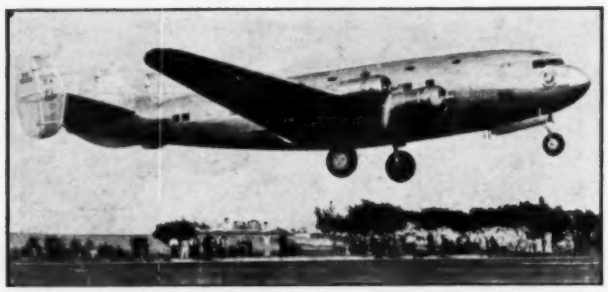
War planes and more war planes is the topic of the day in the aeronautical world. With over sixty new designs of commercial planes before the Bureau of Air Commerce for approval, almost twice that number of military designs are being molded into shape! Almost a year ago we gave you the first hints that Douglas would build a giant bomber and now here are some more facts stirred up by James Bassett, Jr., well-informed aviation writer for the "Los Angeles *Times*." The bomber will have the astounding wingspread of 250 feet and will weigh 160,000 pounds! A proposal of a commercial version of this plane was submitted to Pan-American as the only landplane in the competition. About six or eight 2,000 horsepower engines will power the huge stainless steel craft.

Douglas's subsidiary, Northrop, is also working on something larger than they have ever attempted before, a big twin-engined attack bomber!

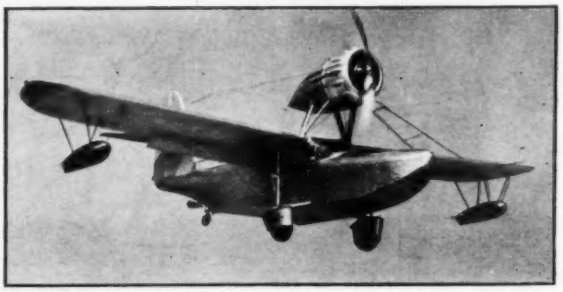
An old timer in the aviation business, Captain R. H. Martin, has formed the Martin Aircraft Corporation and hopes to raise all of $2,000,000 for the production of a superpursuit plane. There will be



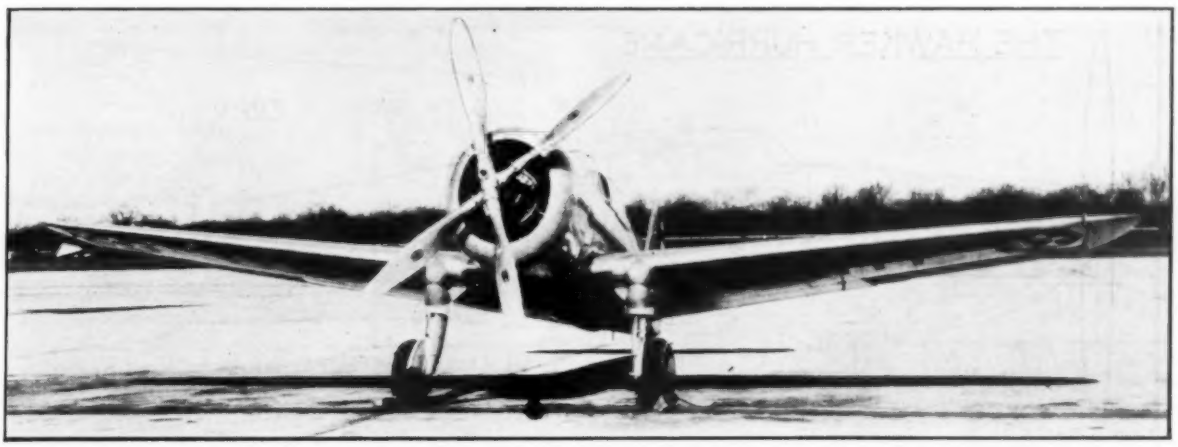
America's mightiest flying clipper, the 74 passenger Boeing No. 314, built for Pan-American Airways. It weighs more than 41 tons when fully loaded.



The huge new Douglas DC-4 four engine 40 passenger transport. The three wheel landing gear is an innovation. (Globe)

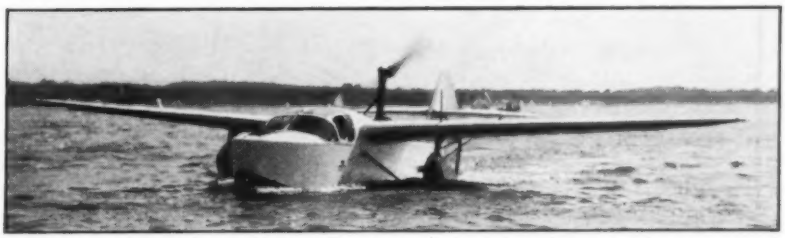


The Fleetwings F5 amphibian. It is of welded steel construction and flies 150 m.p.h. with four passengers.



The Army's new Curtiss single-seater fighter equipped with two oppositely rotating propellers. (International)

American Airplane Business is Increased by Foreign Orders—New Developments in the Field of Design and Construction—Building a Scale Hawker Hurricane.



The Spenser-Larsen SL-12C amphibian. The 125 h.p. engine is in the hull while the propeller rotates at the end of a vertical column above the hull and wing. (Soderberg)

seventeen machine guns on board in groups of three, (we do not know where the odd one will go). A speed of 350-400 miles per hour is expected. Even if the corporation does not obtain sufficient operating capital it will at least have gotten its correspondence mixed with that of the Glenn L. Martin Company before they withdraw their activities.

Mr. Miller, who designed Frank Hawks' last racing plane, is said to be building a military version of it at the present time . . . and do not be surprised if Curtiss comes forth with a twin-engined pursuit plane.

While Bell definitely received their order for thirteen fighters, Lockheed also obtained an order for thirteen basic training and command airplanes which are similar to the Lockheed 12 commercial ships. But that is only a slice of this month's news, for we can always depend on Consolidated to come forth with something of a startling nature also. She has designed and is now building a flyingboat for the navy, grossing more than 100,000 pounds, which will mean that the airplane will be almost twice as large as Consolidated's recently completed four-engined navy patrol ship. Then there is talk at the factory of a three hundred passenger, single-hulled flyingboat. The unique feature of it is that the hull retracts into the fuselage as do the wing floats.

But in the meantime it seems rather certain that Consolidated will get that flying-boat order from Pan-American Airways. However, we are inclined to think it will be split between two companies cooperating with one another and the Edward G. Budd company. Budd will supply most of the advice for stainless steel construction—for the flyingboats will definitely be all-steel! According to "Aviation," Consolidated may bring out a model of their famous PBY flyingboats with an amphibian gear. There will be a nose wheel that will retract into the bow. Just in the offing though, Consolidated's big business will be the construction of several of their four-engined planes for the navy. The navy appropriated funds for the purchase

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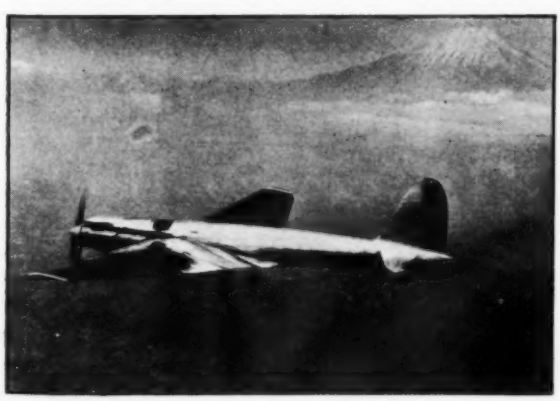
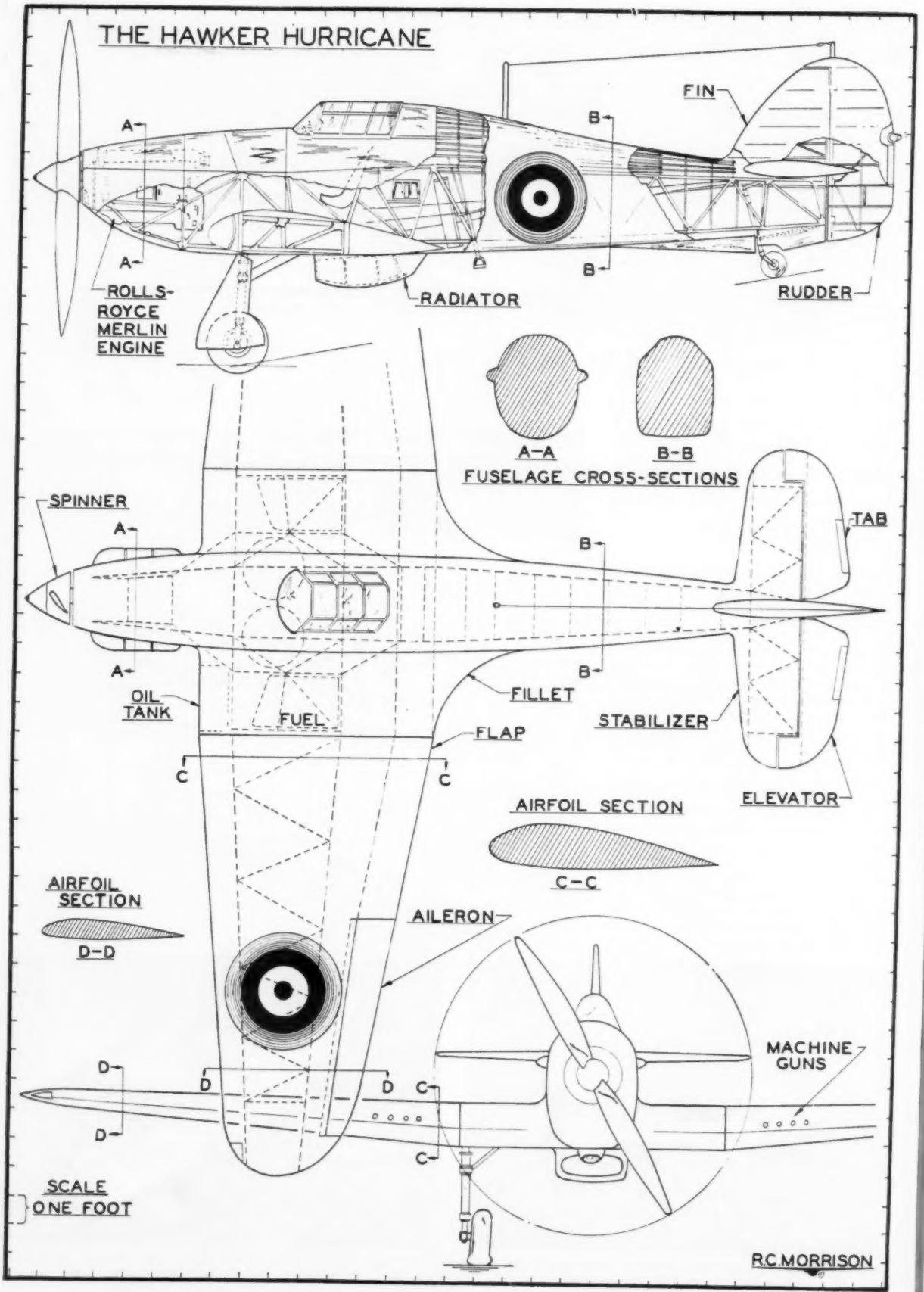


The giant new Japanese long distance plane which flew 7,245 miles in 62 hours and 32 min. (Acme)

The new Short "Sunderland" flying boat bomber now being built in quantity for the British Air Force.


THE HAWKER HURRICANE
FIN
A
B
A
B
ROLLS-ROYCE MERLIN ENGINE
RADIATOR
RUDDER
A-A
B-B
FUSELAGE CROSS-SECTIONS
SPINNER
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A
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FUEL
FILLET
FLAP
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AIRFOIL SECTION
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SCALE ONE FOOT
R.C.MORRISON

Tricky "Props" For Flighty Ships

Two Expert Model Fliers Tell You How to Make Free Wheeling Folding Propellers and Give Other Suggestions on Model Design

First Author Dick Everett Says:

By DICK EVERETT and VERNON BOEHLE

WHILE not the latest, but probably the most efficient development that the new rules have brought to light are the folding propellers. This was first observed by the writer at the Junior Aviator Nationals of 1935, when Bob Cahill used one on his 300 inch job. His ship was not consistent for the simple reason that the prop would not always stop in the correct position. Then in 1937 the Cahills scored again, when Jimmy took his ship to the Nationals and walked away with a first prize and a place on the Wakefield team. His high time can be attributed to the fine streamlining and the resultant low resistance that his ship presented in the glide. He used a one-bladed folding prop and his ship had, by far, the flattest glide of any. Some of the Chicago boys also had folding props but the way that they folded was not observed. There were also some new type of free-wheelers and ideas for feathering props. Altogether the gang tried everything to decrease resistance in the glide. The one-bladed prop is not the most efficient to use because there is so much vibration, but it will work quite well. Jimmy Cahill used a piece of aluminum for a hinge, which stuck out in back of the hub. The only difficulty there is with this particular type is that you must be able to get aluminum which should be of Dural, and that a small drill of 1/32" in diameter is used to drill a hole for the axle. The idea shown consists of merely wire and

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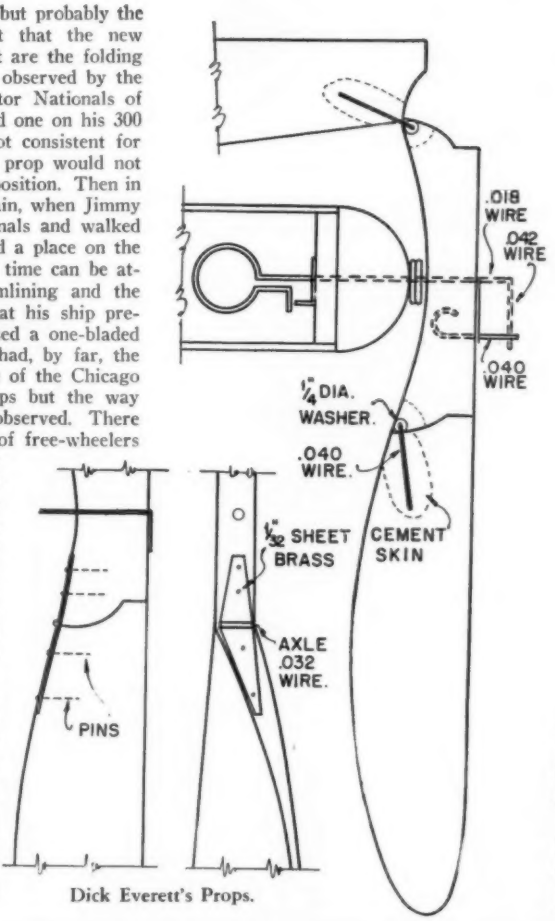
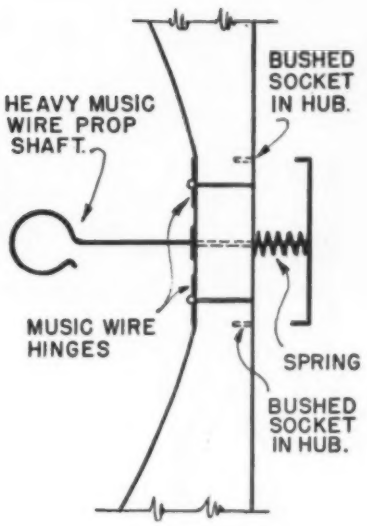
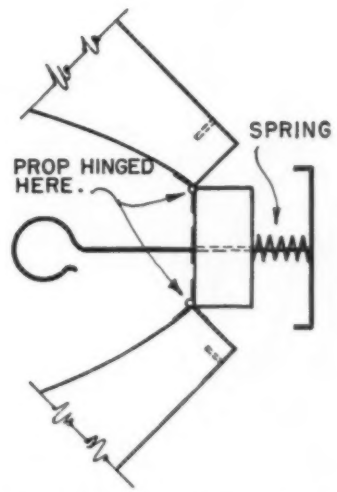


Dick Everett's Props.





USING FREE WHEELING PRINCIPLE, THE MOTOR WHEN WOUND PULLS PROP SHAFT INTO BUSHED SOCKETS IN TOP OF PROP HUB. THIS LOCKS BLADES UNTIL MOTOR IS UNWOUND WHEN THE SPRING FORCES SHAFT OUT OF HUB AND PERMITS THE FORCE OF THE AIR TO PUSH THE BLADE ENDS BACK.

The Plane on the Cover

The Russian Fighter Z.K.B. 19 (I-17)

By ROBERT McLARREN

OUT of the maw of the Spanish holocaust have come fighting planes whose stuttering snouts are bloody with hard-fought victories. Never in history have airplanes been subjected to such grueling punishment as these modern pervaders of death. Hypothetical acceptance tests under simulated battle conditions may prove a ship's strength, but only the raucous snort of cannon fire and the scream of lethal slugs can bring out the true fighting ability of untested types. Such is the brief but intense heritage of the ship lancing across our cover this month: The Russian Z.K.B.19 (I:17).

This low-wing, all metal monoplane is Russia's answer to world-wide accusations that her equipment is slow, heavy, and awkward, and that she is incapable of producing a fighting plane worthy of comparison with those of other nations. She has retaliated with a craft capable of holding its own in the world's fastest company, and this under the most adverse manufacturing conditions to be found anywhere in the world today.

Russia's aviation industry comes under the jurisdiction of the Glavavioprom, the Central Directorate of Aeronautical Industries. This group answers, in turn, to the Commissariat for Heavy Industries, the controlling industrial branch of the U.S.S.R.

Within the Glavavioprom are three divisional branches of technical organization: the Zagi, or Central Aero Hydrodynamics Institute, which is responsible for all aircraft design, development, and experimental research; the Zaim, which functions accordingly for aviation engines; and the

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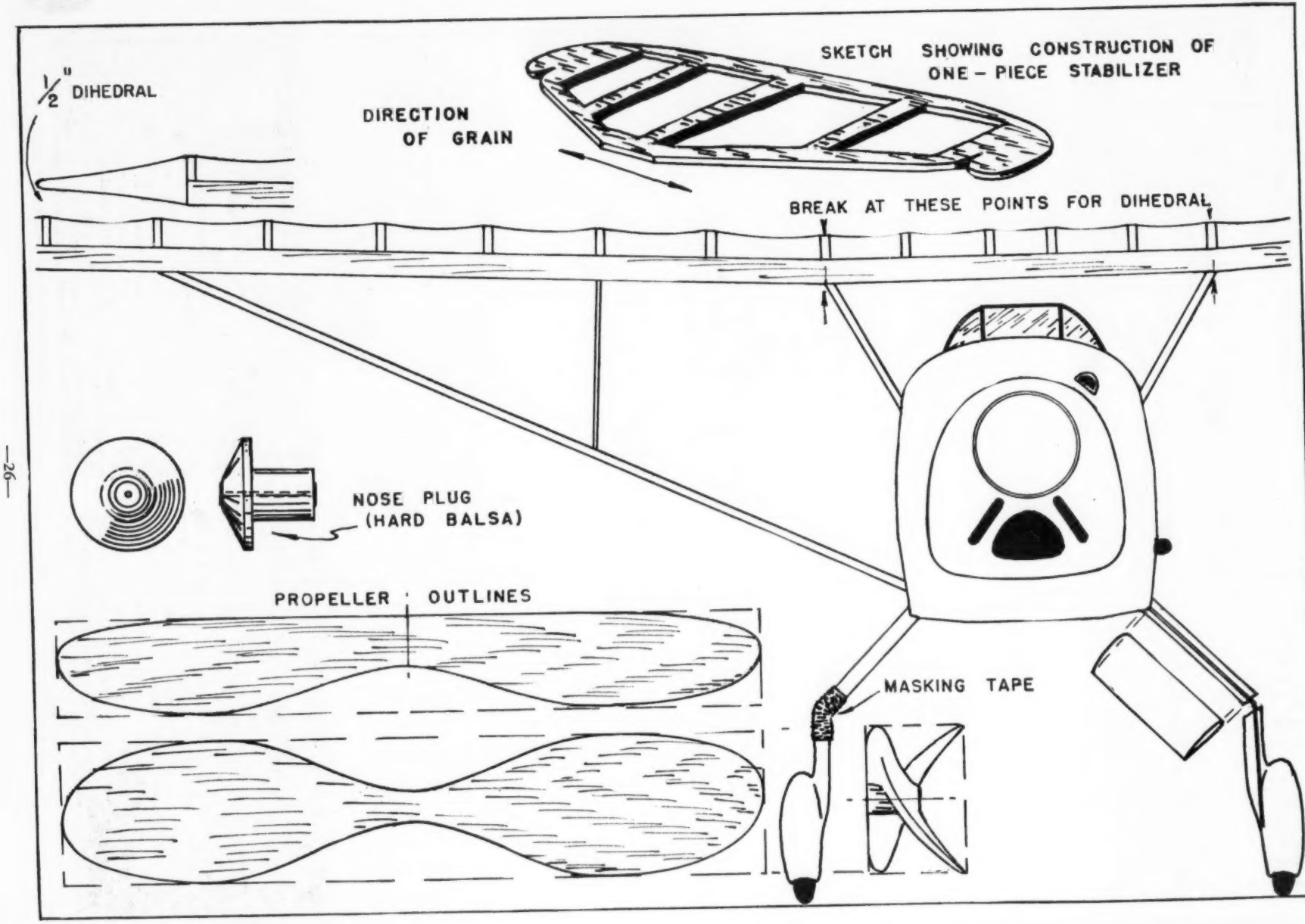
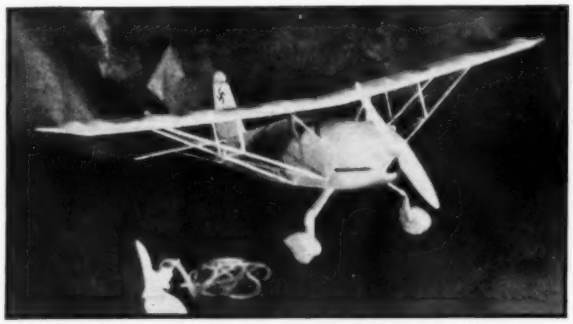

SKETCH SHOWING CONSTRUCTION OF ONE – PIECE STABILIZER
1/2" DIHEDRAL
DIRECTION OF GRAIN
BREAK AT THESE POINTS FOR DIHEDRAL
NOSE PLUG (HARD BALSA)
PROPELLER OUTLINES
MASKING TAPE



The Parasol wing promotes stability in flight.

It is very realistic when properly built and decorated.

How To Build The Arado Trainer

A Realistic Scale Model of a Famous German Acrobatic Trainer—a Very Consistent Flier Because of Its General Design

By PAUL PLECAN

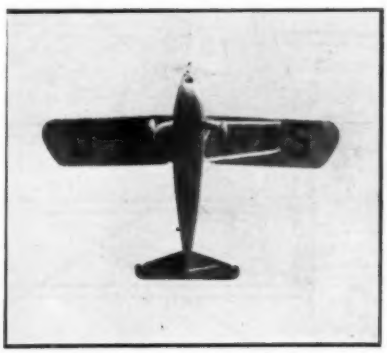
THE model presented this month is the German Arado 76 acrobatic trainer, the prototype of which is known for its maneuverability and quick recovery from spins and other abnormal attitudes of flight. Powered with the popular Argus As-10-C inverted V-8 motor of 240 H.P., the Arado attains a top speed of 170 miles per hour at normal altitudes, and lands at the comparatively low speed of 63 miles per hour. With an empty weight of 1554 pounds and a useful load of 628 pounds, the gross weight totals up to the figure of 2182 pounds. The climb is 1315 feet per minute, and the service ceiling is 20,998 feet.

The model has been accurately scaled down, both in dimensions and performance, and is very stable when provided with the flying scale stabilizer and prop shown in the plans. Due to the nicely arranged parasol wing, scale dihedral is used without loss of stability. The construction is simple, and the method shown for making the ribs lightens the model for flying, yet permits a fine covering job to be done on the wing. After familiarizing yourself with the plans and details of construction, you may begin building the—

Fuselage

The front and top of the fuselage are the first parts to be made, and there are two methods of making them. First, the nose block may be hollowed out the same as the top portion, which is called the "turtle-deck."

The second method is to hollow out the nose block, assemble the rest of the fuselage framework behind it, and build up the turtle-deck by cementing the proper formers in their places and covering with sheet balsa.

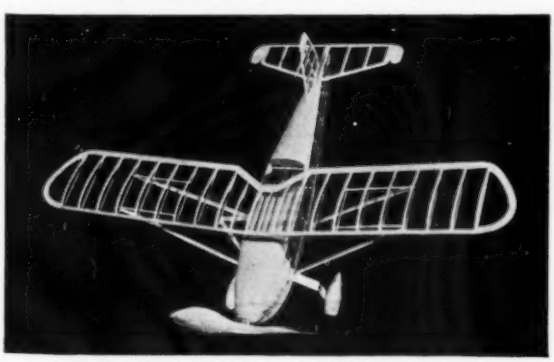


Passing Over in full flight.

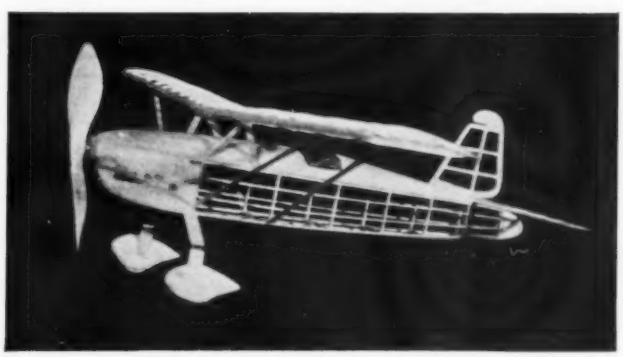
The first mentioned method, that of hollowing out all the parts, is simpler, and beginners should use it. After the balsa blocks of the required size have been procured, the side view of the fuselage front should be traced upon them by piercing the lines on the plan with pins, or traced on with the use of carbon paper. After carving to the shape shown in the side view, the blocks should be trimmed down to the cross-section shown in the front view. The nose block may be hollowed out with a knife or a gouge, care being taken that the proper thickness is obtained. The best way of approximating the thickness of the wood is to put it next to a powerful light, the thinnest parts being visible by the greater amount of light they admit through the wood. The turtle-deck is carved and holiowed in the same manner as the nose block, and after the two are finished they should be cemented together. The two fuselage sides should be made now and the cross braces cemented in. It will be found that the fuselage will have a smaller tendency to warp if the two bottom longerons are moistened before forming, so that when they are dry they will retain their bent shape without putting a strain on the other parts of the fuselage. Since the nose block has already been finished, the rear built-up portion can be cemented to it and set aside to dry.

If the modeler wants to make the built-up type of turtle-deck, it may be constructed now on top of the rear of the fuselage instead of cementing the hollowed out type on. While the fuselage frame is drying, the landing gear struts may be formed, and the wheel pants made. The wheel pants need no explanation, as they are of the type with a hollowed out core and sheet balsa sides

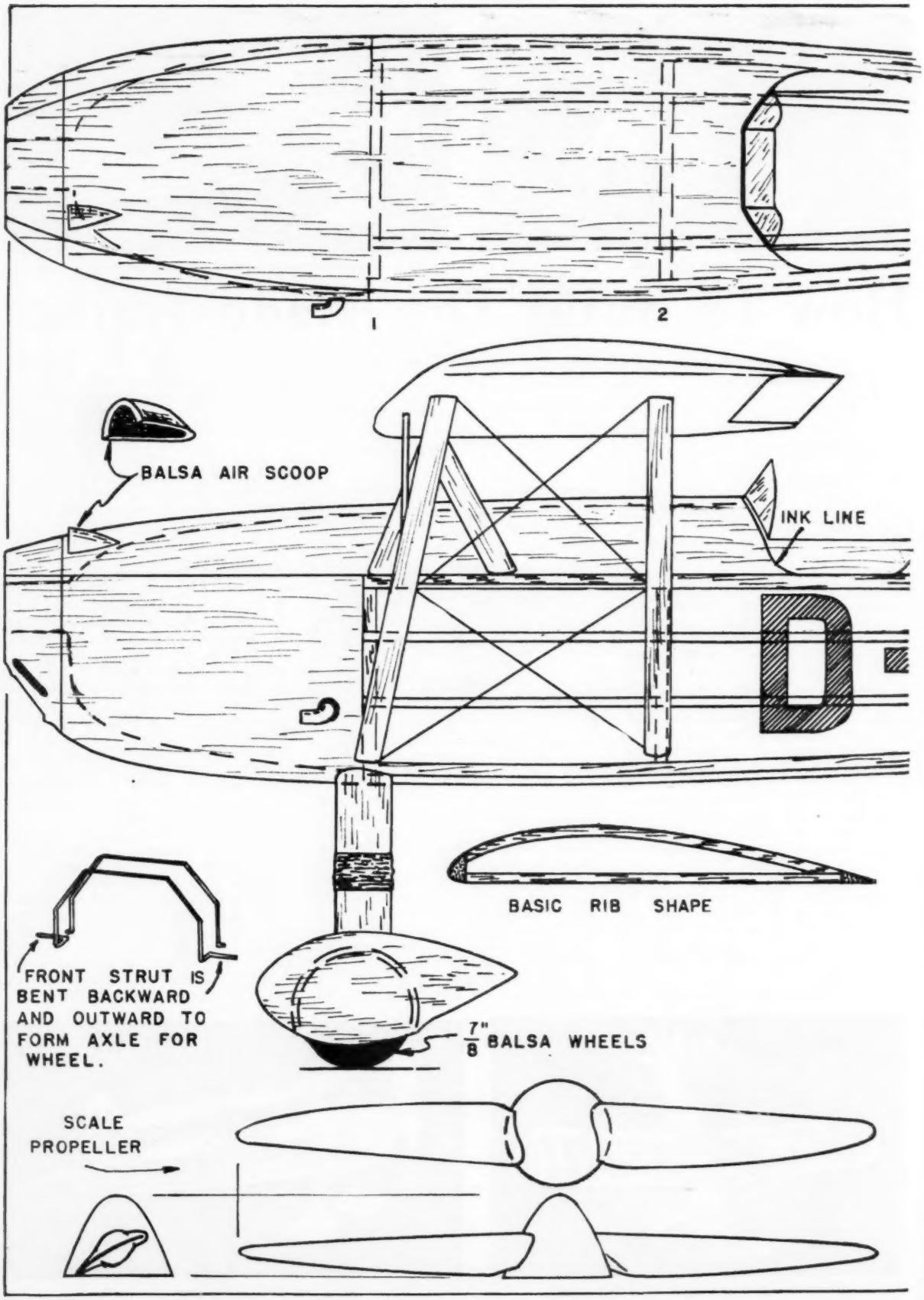
(Continued on page 42)

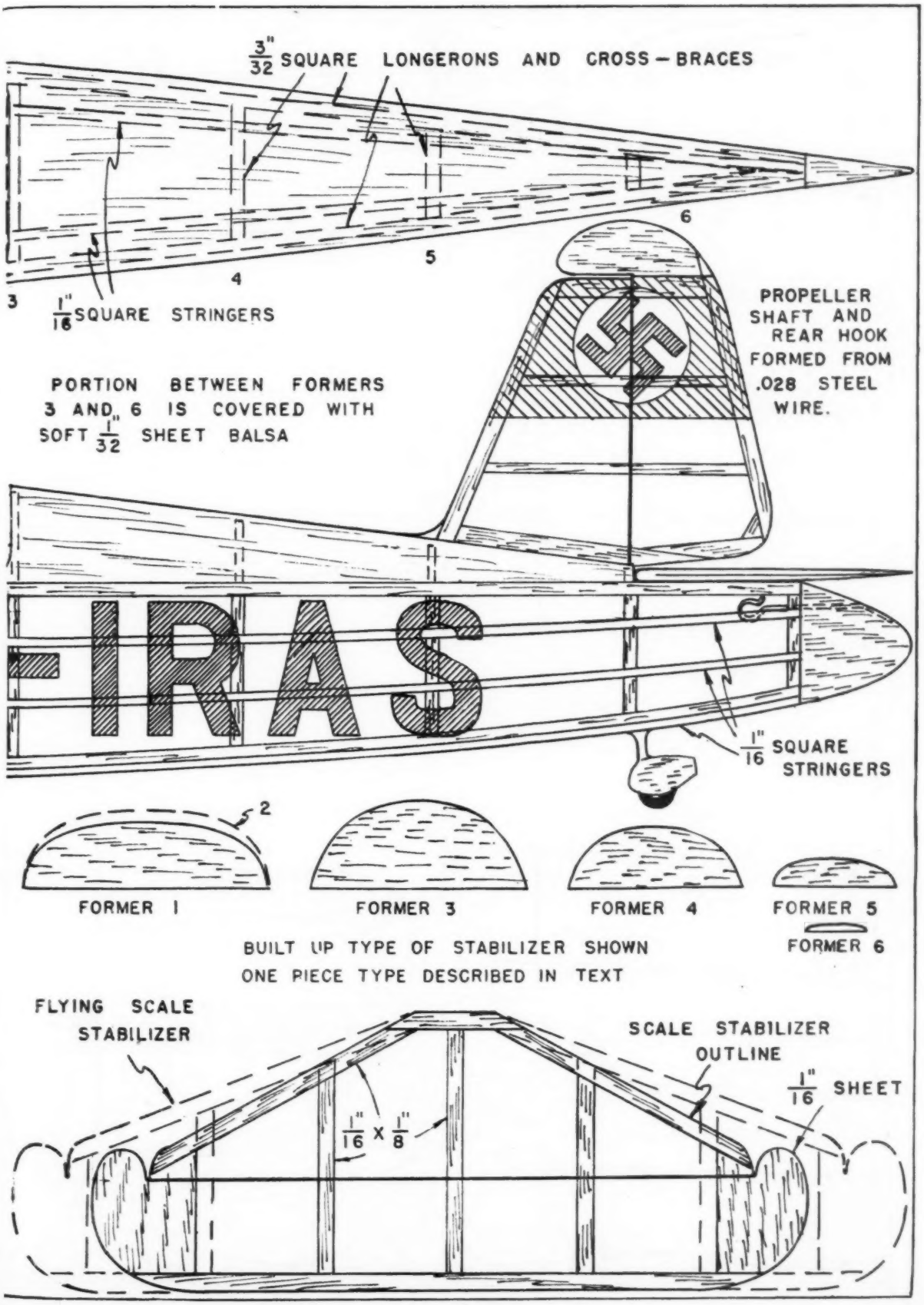


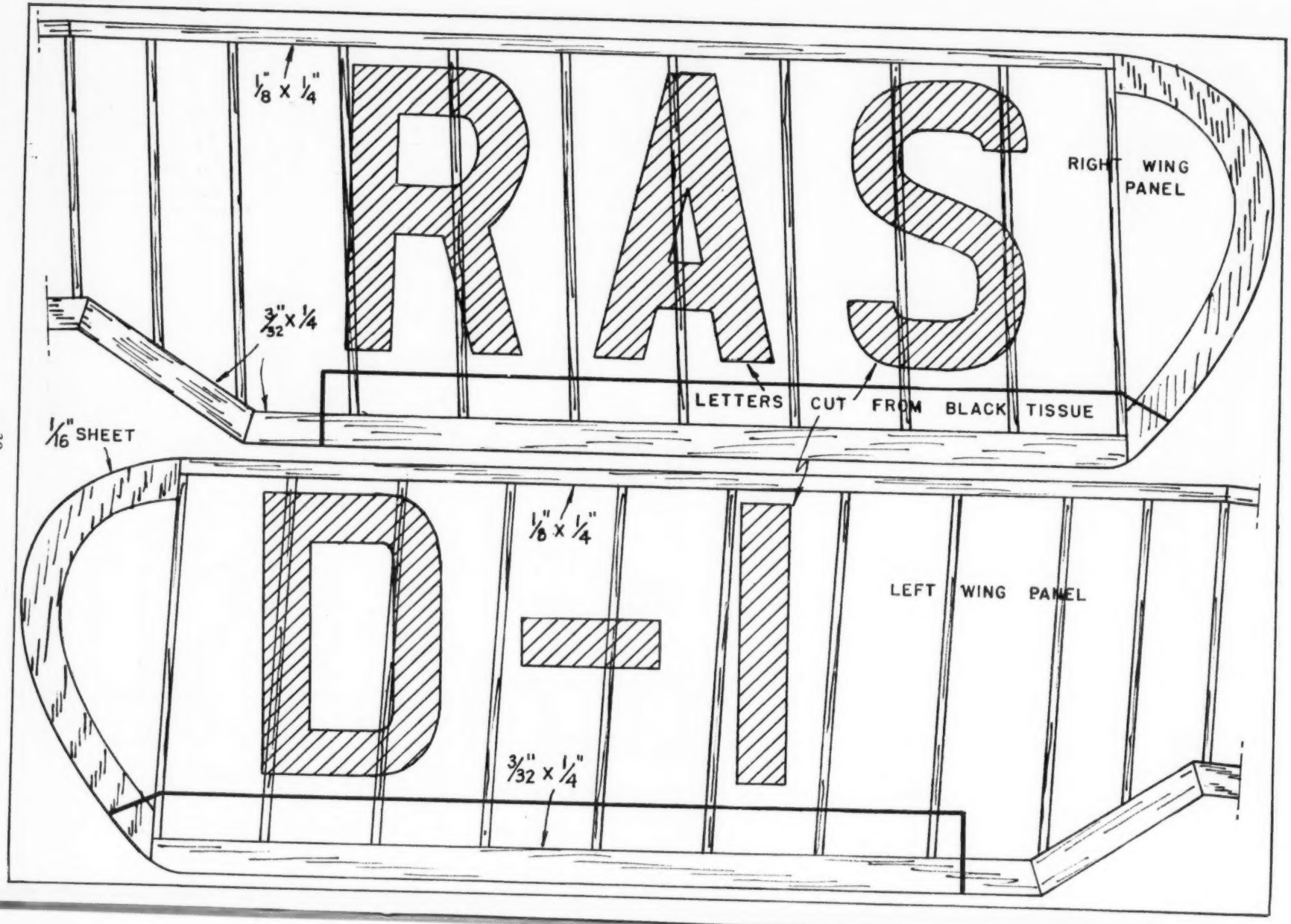
The uncovered frame work with flying prop.



Here you see how the wings are built.


1
2
BALSA AIR SCOOP
INK LINE
BASIC RIB SHAPE
FRONT STRUT IS BENT BACKWARD AND OUTWARD TO FORM AXLE FOR WHEEL.
7/8" BALSA WHEELS
SCALE PROPELLER


3/32" SQUARE LONGERONS AND CROSS-BRACES
3
4
5
6
1/16" SQUARE STRINGERS
PORTION BETWEEN FORMERS 3 AND 6 IS COVERED WITH SOFT 1/32" SHEET BALSA
PROPELLER SHAFT AND REAR HOOK FORMED FROM .028 STEEL WIRE.
FIRAS
1/16" SQUARE STRINGERS
2
FORMER 1
FORMER 3
FORMER 4
FORMER 5
FORMER 6
BUILT UP TYPE OF STABILIZER SHOWN
ONE PIECE TYPE DESCRIBED IN TEXT
FLYING SCALE STABILIZER
SCALE STABILIZER OUTLINE
1/16" SHEET
1/16" X 1/8"


1/8" x 1/4"
RIGHT WING PANEL
3/32" x 1/4
LETTERS CUT FROM BLACK TISSUE
1/16" SHEET
1/8" x 1/4"
LEFT WING PANEL
3/32" x 1/4"

Designing Your Gas Model Prop

How to Determine the Correct Diameter and Blade Width of Your Propeller for Various Pitch Values and Engine Powers

Article No. 77
Chapter No. 5

By CHARLES HAMPSON GRANT

IT HAS been explained in the preceding article how to find the correct diameter and width of your propeller that will give the best results for a motor of any power, *when the pitch of the propeller is eight inches.* These important facts were determined by means of the graph appearing at the bottom of this page.

Here is another example of how to proceed that will help you to understand the problem thoroughly. If the power of the engine to which the propeller is to be attached is one-seventh horsepower (cubic inch piston displacement of 0.42) and the blade width is to be one-eighth the diameter; the graph shows that the (A) line for this proportion crosses the (0.42 Cu) line at the 13 inch diameter line. Thus in such a case the diameter should be thirteen inches; the width will be 13/8 or 1.625 inches. This width is for a pitch of eight inches and it may be determined by means of the graph as well as by calculation. You will note that the vertical pitch line at (13) intersects the (A) line at a point half-way between dotted lines (4) and (5). These are lines of equal blade width.

In the table at the upper right-hand edge of the graph in the eight inch pitch column, you will see that the width specified in the line (4) horizontal column is (1.5). The eight inch pitch value for line (5) is 1.75. As the point of intersection of line (A) and the thirteen inch diameter line is half-way between line (4) and line (5), then the value of the blade width should be half-way between 1.5 and 1.75, or 1.625.

If a diameter of thirteen inches and a pitch of ten inches is desired, the correct value for the blade width would be 1.3 inches. This is the value that is half-way between the values of (1.2) and (1.4) in the ten inch pitch column of the table. This blade width for ten inch pitch of course is not equal to one-eighth the propeller diameter. It is the (W_B) value required to insure an engine speed of 4000 revolutions per minute when the diameter is thirteen inches and the pitch ten inches.

A propeller of these proportions will operate satisfactorily but if a propeller is desired which is to have a blade width of one-eighth or some other definite proportions of the diameter and a pitch of ten inches, a different procedure must be followed.

Because of the increase in pitch from eight to ten inches, the area must be decreased in the same proportion when the diameter is the same. This reduction in

(Continued on page 37)

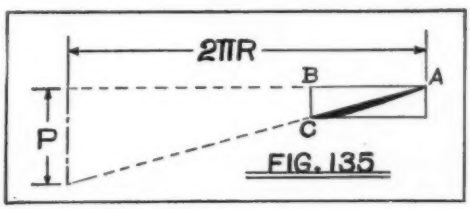


FIG. 135

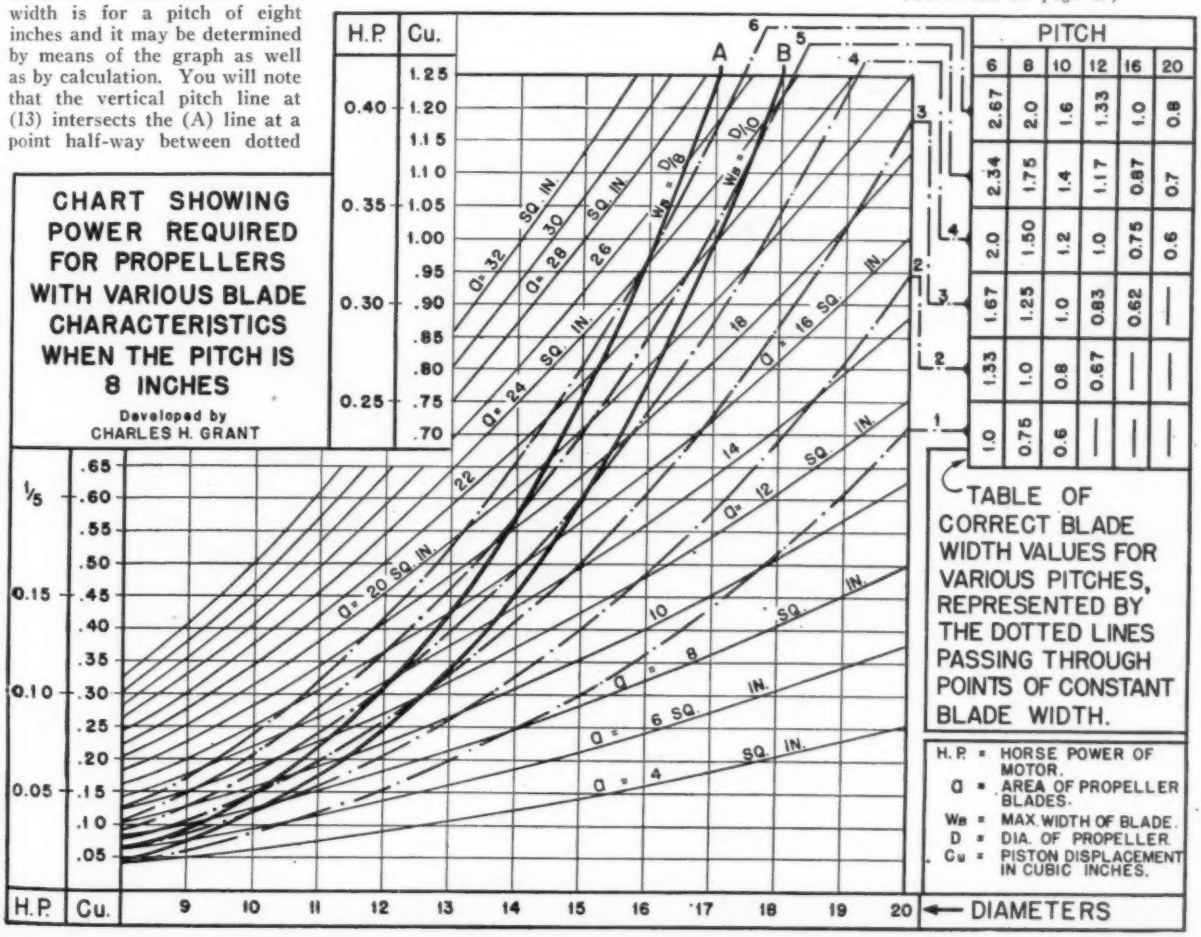
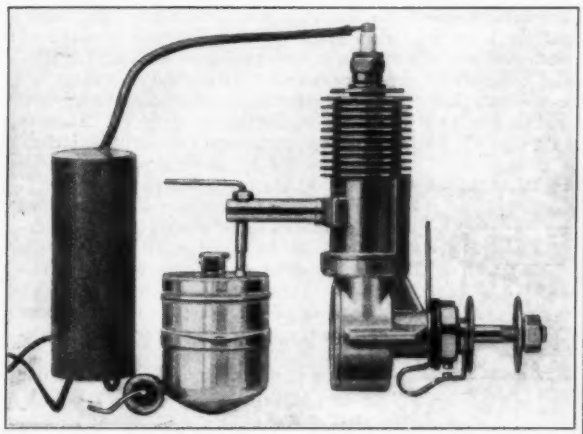


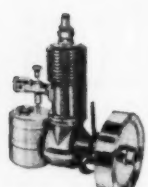
CHART SHOWING POWER REQUIRED FOR PROPELLERS WITH VARIOUS BLADE CHARACTERISTICS WHEN THE PITCH IS 8 INCHES
Developed by CHARLES H. GRANT
H.P.
Cu.
A
B
PITCH
6 8 10 12 16 20
2.67 2.0 1.6 1.33 1.0 0.8
2.34 1.75 1.4 1.17 0.87 0.7
2.0 1.50 1.2 1.0 0.75 0.6
1.67 1.25 1.0 0.83 0.62 —
1.33 1.0 0.8 0.67 — —
1.0 0.75 0.6 — — —
TABLE OF CORRECT BLADE WIDTH VALUES FOR VARIOUS PITCHES, REPRESENTED BY THE DOTTED LINES PASSING THROUGH POINTS OF CONSTANT BLADE WIDTH.
H.P. = HORSE POWER OF MOTOR.
Q = AREA OF PROPELLER BLADES.
Wb = MAX. WIDTH OF BLADE.
D = DIA. OF PROPELLER.
Cu = PISTON DISPLACEMENT IN CUBIC INCHES.
DIAMETERS

SCIENTIFIC'S FINE REPUTATION

BROWN, JR., MOTORS USED IN PLANES WINNING 1st, 2nd, 3rd, 4th, and 5th PLACES at RECENT EASTERN STATES GAS MODEL MEET



MODEL B
Long famous for power, smooth running, and high compression. Complete, ready to run
$21.50
Postpaid



MODEL M MARINE
Built to high exacting standards for use in model boats. Complete, ready to run
$15.00
Including Flywheel
Postpaid

MODEL C
Offers the proven advantages of the Brown Jr. motor at a medium price. Complete, ready to run
$17.00
Postpaid

SCIENTIFIC

OFFERS YOU THIS FINE NEW MODEL D BROWN JR. ENGINE

At the Exceptionally Low Price of

ONLY $10

Complete, Ready to Run

POSTPAID

—IMMEDIATE DELIVERY—

● THE New Model "D" has everything that users have come to expect of Brown Junior Motors: power, speed, stamina, and sound engineering advances. In every way it lines up with the famous Brown motors that have won first places and flight records everywhere. The same high quality metals are used, such as alloy steel cylinder with aluminum alloy piston and 2 special rings, forged aluminum connecting rod, simplified pin type control, and other high quality features. Not long ago you had to pay as much for a knockdown motor kit as you do now for the completely finished ready-to-run Brown Jr. precision motor. For the power delivered, the Brown Jr. motor is undoubtedly the lightest miniature gasoline motor manufactured, thoroughly tested and run under actual performance conditions. For 100% satisfaction power your model with a Brown Jr. motor. Order early from Scientific for immediate delivery. COMPLETE ENGINE READY TO RUN, INCLUDING FUEL TANK, COIL, CONDENSER, ETC., ONLY $10.00, POSTPAID.

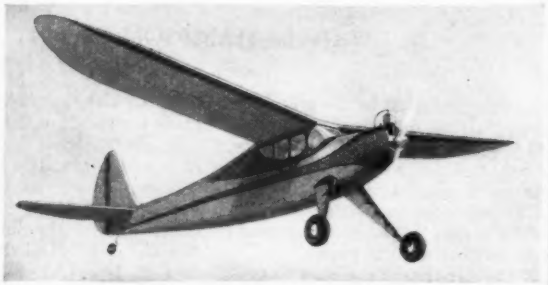
GENERAL SPECIFICATIONS

⅞" Bore, 1" stroke; 1,200-10,000 R.P.M.
Height 4¼". ⅛th Horsepower.
Actual scale weights: Bare motor.....6½ ozs.
Complete with coil, tank, and condenser (as furnished).....11½ ozs.
Ready to run, with gas, two batteries, and propeller.....20½ ozs.
Two standard 1½ volt flashlight cells required for current.

Included at no additional cost is a motor manual containing all information on the operation and care of your engine. This manual is included with all Brown Jr. engines.

DOUBLE GUARANTEE

Buy your gas engine from SCIENTIFIC and you will be protected by the double guarantee—guaranteed by the factory and again by SCIENTIFIC.



FIREFLY

BY POPULAR DEMAND A NEW GAS TYPE RUBBER POWERED MODEL AIRPLANE

The "FIREFLY"

Wingspan 36" Length 28" Weight 4 ozs.

$1.95 POSTPAID or at your dealer including M & M Pneumatic rubber Wheels

KIT CONTAINS EVERYTHING required to [build] complete, spark plug; M & M pneumatic wheels with inflating [tube] propeller; all ribs, bulkheads, fairings, etc. clearly pri[nted] banana oil, and a vial of rubber lubricant; brown conte[xt] and all necessary metal for building the ratchet motor-[driven] of the most complete and easily understood plans [ever] biggest [value] ever s[old] Order [NOW].

TROJAN M
3½" High. Bore. ⅛ H.P. [Engine] Weight — Power. Postpaid $18.50

OTHER [ENGINES]
Husky Jr.....$[2]
Pee Wee.....[$]
M & M Engine [Co.] Engines are [ready] cluding coil, [propeller] instructions.

NOW! THE SENSATIONAL *RED ZEPHYR* GAS MODEL

ONLY **$4.95** POSTPAID (Less wheels)

Complete Kit, Including 3½" Pneumatic Rubber Wheels **$5.95** POSTPAID

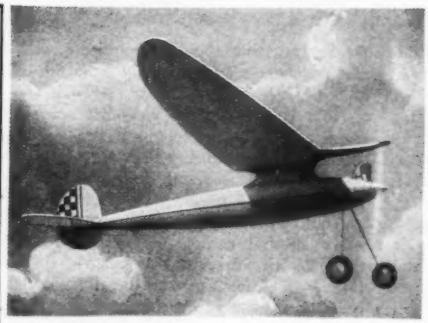
6 ft. WINGSPAN; 56" LONG; WEIGHT (Less Motor) 2½ Lbs.

HOLDER OF PRESENT CHAMPIONSHIP OF FRANCE

DESIGNED IN RESPONSE TO THE DEMAND FOR A RELIABLE GAS MODEL AT A REASONABLE PRICE. THE ONLY LOW PRICED MODEL WITH ALL THESE VITAL FEATURES:

PRECISION BUILT! Accurate, fully detailed, full size drawings and complete instructions guarantee you a perfect model, easily constructed.
QUALITY FEATURES! Simple and highly efficient aerodynamic design with low wing loading.
PERFORMANCE! Takes off from the ground unassisted in about 25 feet, climbs beautifully, and lands perfectly.
ECONOMY! The most inexpensive GOOD model to buy, so simple in construction that upkeep cost is nothing.
SPECIAL FEATURES! Full shock-absorbing landing gear with new type, easily attached brackets. Vibration absorbing motor mount. Reinforced nose and hook to protect motor. Wings quickly demountable for easy transportation.
HERE'S WHAT THIS KIT CONTAINS: Complete printed out wood, including ribs, bulkheads, wing tips, rudder sections, etc.; all strip wood of finest quality accurately cut to size; bamboo paper; rubber; complete set of hardware including nuts, bolts, landing gear brackets, and heavy wire, battery wire, washers, etc.; large can gas model cement; streamlined tail wheel; 2 large sheets of full size plans with instructions, photographs, diagrams, and detailed illustrations—everything you need to build this wonderful gas model.
Fly the Red Zephyr with the new Model "D" Brown Jr. engine (Price $10.00) and you will have the finest combination possible. The complete combination price of $14.95 for engine and airplane is sensationally low. Order now while the supply is plentiful.

AS BUILT ON VALUES LIKE THESE

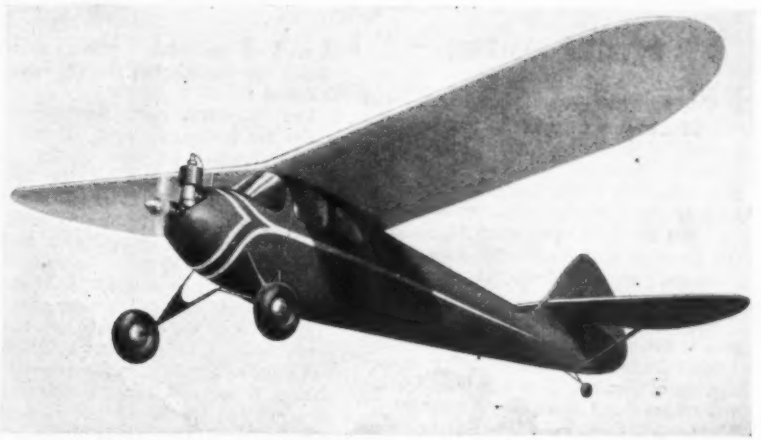


VALKYRIE

GAS TYPE RUBBER POWERED MODEL

Wingspan 24"
Length 15"
Weight 1¼ oz.
Flies ½ mile

The "Valkyrie" incorporates all the attractive and outstanding features of its gas model original; can be easily constructed in 4 or 5 hours. Sturdily built with continuous one-piece wing root built into fuselage and securely attached to underside of wing. Dummy motor looks like the real thing and is easily built. Beautifully colored and a real super-streamlined flyer. Complete kit, with full size plans and instructions, postpaid..... **$1.00**



A NEW SMALL GAS MODEL

DESIGNED FOR USE WITH SMALL GAS ENGINES

Wingspan 44" Length 32" Flying Weight with Motor 17 ozs.

The "Eaglet" is the finest small gas model in existence today. It has a climb that can be described mildly as spectacular, and a flat glide that is really sensational. Simplified so that any model builder with little or no experience can build the model easily. Requires only ⅓ the time to build that large gas models require.
KIT IS 100% COMPLETE including M & M Pneumatic Wheels; 10" semi-finished propeller; ribs, bulkheads, fairings, etc. printed on balsa; tail wheel; battery box, etc.; liquids; all required insignia; full size plans with complete information. On test flights the "Eaglet" was flown very successfully with the Brat and Trojan engines, available direct from Scientific at prices listed.

DE LUXE KIT

$3.95 POSTPAID OR AT YOUR DEALER

Including M & M Pneumatic Rubber Wheels

ALL THE THRILLS OF GAS MODEL FLIGHT!

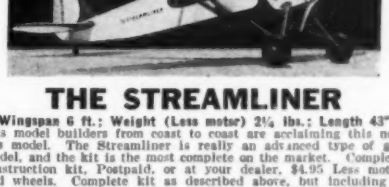
NO EXPENSIVE GAS ENGINES NEEDED WITH THESE MODELS—A DUMMY ENGINE IS SUPPLIED WITH EACH KIT

The FLEA

Wingspan 36" Length 28" Weight 4 oz.

This gas-type rubber-powered model will give you all the thrills of building and flying a real gas model at a fraction of the cost.
KIT CONTAINS EVERYTHING required to build the model 100% complete: Pair of 1⅝" M & M pneumatic wheels with inflating tube; tru-pitch 10" balsa propeller; ribs, bulkheads, etc., printed on balsa; cement; clear dope; rubber lubricant, etc.; brown contest rubber; all necessary metal for building ratchet motor-hum effect; easily understood plans including all information on building and flying the "Flea" model.

Looks like a gas model—flies like a gas model—sounds like a gas model—yet costs only..... **$1.95** Postpaid or at your dealer, including M & M Pneumatic rubber wheels



THE STREAMLINER

Wingspan 6 ft.; Weight (Less motor) 2¼ lbs.; Length 43"

Gas model builders from coast to coast are acclaiming this new gas model. The Streamliner is really an advanced type of gas model, and the kit is the most complete on the market. Complete construction kit, Postpaid, or at your dealer, $4.95 Less motor and wheels. Complete kit as described above, but including a pair of 3½" pneumatic rubber air wheels (value $1.50 pair) Less motor, POSTPAID..... **$5.95**

MISS AMERICA

7 Ft. DeLuxe Gas Model STILL THE NATION'S BIGGEST KIT SENSATION

Weight (less Motor) 2¾ lbs. 22 Minutes on 1 oz. 16 to 1 glide.

Kit is complete with 3½" pneumatic wheels and finished prop. If you want a reliable flyer for general sport or contest flying, ask your dealer to show you this Miss America model, or order direct from Scientific. Complete Kit $9.50 postpaid, less motor. Miss America Kit and Brown Jr. "D" Motor only $19.50, postpaid.

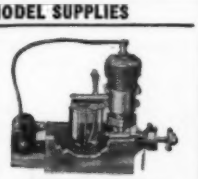
SPEED SCIENTIFIC RUBBER POWERED AND GAS MODEL SUPPLIES

NOW SYNCRO ACE ONLY

$13.75 Postpaid

NEW! SELF-STARTER
Cranks your model engine for you. No booster batteries needed. Simple, positive, safe! Press the button and your motor runs.
$3.00 Postpaid

1¼", 1⅜", 1½", 1⅝"—pair 90c
1¾", 1⅞", 2⅛" 2½", 2⅝"—pair 60c
3½"—pair $2.75
4½"—pair 2.75



The NEW OHLSSON
With transparent celluloid gas tank; ⅞" bore, 15/16" stroke, 500 to 14,500 R.P.M., ⅓ H.P., Bare weight 6½ oz., height 4¾", 20 min. on 1 oz. fuel. Radial or side mounting. Complete with tank, coil and condenser.
Postpaid..... **$18.50**

CHAMPION SPARK PLUGS EACH 65c

BALSA WOOD WHEELS
" diam. pair .03
" diam. pair .05
" diam. pair .08
" diam. pair .10

DOUGHNUT RUBBER WHEELS
diam. pair .15
" diam. pair .18
" diam pair .20

CONDENSERS
1 1¼" long.... .20
2 1¾" long.... .20
Condenser with mounting ..... .25
Extra light condenser ..... .25
Brown, Jr. Coil.. 3.50
Firecracker Coil.. 2.50

SCIENTIFIC BROWN RUBBER
More winds, more power, more duration.
flat skein
3 ft. .01: .65
2 ft. .01: .75
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BAMBOO PAPER
36 sheets, ea. 7c;
for 23c
Hour or reel, ea. 10c

GAS MODEL BALSA STRIP BALSA
5 Foot Lengths

⅛x⅜	.02
⅛x½	.04
⅛x⅝	.06
3/16x3/16	.04
¼x¼	.06
¼x½	.10
¼x¾	.10
⅜x¾	.10
½x½	.12
1x1	.25

SHEET BALSA
5 Foot Lengths

1/32x2	.10
1/32x3	.15
1/16x2	.12
1/16x3	.18
⅛x2	.15
⅛x3	.20

$1.95 POSTPAID

REPLACE YOUR OLD COIL NOW WITH A

$2.50 Postpaid
You'll be surprised at the new pep and power your engine has.

NEEDLE VALVE
All series: X, A, B, C, and D
Guaranteed. Ea.... .50

MOISTURE-PROOF HOOK-UP WIRE
In pkgs. of 5 ft. .20

BROWN JR. SPARK PLUGS
Now only..... .65

HURLEMAN SPARK PLUG
Weight ¼-oz., ea. .75

ACCURATE TIMER
Weight ¼ oz.
Each..... 2.50

MINIATURE KNIFE SWITCHES
2-pole switch ea. .25
3-pole switch ea. .35

VALVOLINE MOTOR OIL
Per bottle, with instructions..... .20

MODEL BUILDERS' TOOL KIT
A 75c value for only..... .50

TRU-PITCH GAS PROPS 95c Each

13", 14", 15", 16"

SCIENTIFIC COIL
Each 1.95

MODEL KNIFE
Each 15c

FILTER FUNNEL
Price..... ea. .30

PLANS "MISS AMERICA" GAS MODEL
Set of 3 plans 1.50

"RED ZEPHYR" GAS MODEL
Complete set of 2 plans 1.00
Streamliner 1.00
Eaglet 1.00

SPRING MUSIC WIRE
3/32" diam., 5 ft. .15
⅛" dia., 5 ft. .25
1/16" diam., 3 ft. .10

LANDING GEAR BRACKETS
Complete set of 2 brackets with 6 set screws..... .50

FEATHERWEIGHT LANDING GEAR BRACKETS
Complete set of 4 stampings with 4 screws and nuts, priced low .25

TURNBUCKLES
Length ½" ea..... .20
4 for..... .75
Length 1", ea..... .25
4 for..... .90

SCIENTIFIC PNEUMATIC RUBBER WHEELS
Lightweight — Puncture Proof—Shock Proof.
3½", pair..... 1.50

"ZEPHYR" SILK
Grade A Silk, 36" wide, yard..... .50

ENGINES
...der $18.50
... 21.50
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BAT ENGINE
...gh. Weight 4½
...Bore and stroke.
...H.P. Light, pow...
...Complete
...$.90 postpaid.

ENGINE
...High,
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...red to ...model 100%
...plete, ...cylinder and
...ating ...e-pitch balsa
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...motor-...et; also a set
...plans ...evised. The
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In England: H. & S. Norman, 48 Derby Rd., Kirkhams, Prestwich, Lancs.
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The Hybrid Airplane Contest No. 2

Do You Know Your Airplanes? Enter This Simple But Interesting Contest and Win an Award While You Learn Distinguishing Features of Some of the Modern Airplanes

By NICK LIMBER

FAVORABLE response proves that the Hybrid Airplane Contest has met with the approval of the nation's model builders and aviation enthusiasts. However, to broaden each contestant's chances for an award, we will devote this month's text to reviewing certain contest rules, contest procedure and questions that might have come to the individual's mind while he was solving the first set of diagrams.

The first, and perhaps the most important item to comply with at present, is the time allotted for the solution and mailing of your first set of answers. Note that your first set of answers must be at the office of MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City, not later than midnight, August 19th, if you wish to be eligible for an award. (Data given in August issue was incorrect)

All answers to the first set of diagrams received after the deadline will automatically disqualify the contestant. In view of this fact, make doubly certain that you mail your answers soon enough to reach the office before the deadline. Also, as an additional precaution, it is advisable to indicate on the outside of the envelope that it contains the answers to the Hybrid Airplane Contest diagrams.

This may be accomplished by writing "Hybrid Airplane Contest Answers" plainly on the lower right hand corner of the envelope.

As stated last month, the Hybrid Airplane Contest plans have been prepared by taking parts of different standard airplanes and putting them together to form a composite ship. These parts may be recognized after a close examination of each diagram.

After each part has been recognized you write your answer on the proper answer blank, indicating the model number or letter beside the name.

To illustrate this, we will assume that the fuselage in one of the Hybrid drawings resembles that of a Curtiss Hawk. It will not be sufficient to write the name "Curtiss Hawk" on the answer blank, as several models of the Curtiss Hawk have been designed.

The contestant must also indicate the model number of the ship. If our hypothetical fuselage is that of the Curtiss Hawk P.6, he must not omit the "P. 6" if he wishes to get credit for his answer.

Should the same fuselage be used on a number of other Curtiss Hawk models it is not required that he indicate all the models by letter or number. Only one correct answer is required for each part.

If a part of the composite ship has been taken from an airplane that is well known and often referred to by some popular name, then it is not necessary to indicate model number; i.e., should the tail of a Hybrid ship be that of the "Spirit of St. Louis" it is not necessary to write the trade name and model number of the ship on the answer blank. This however does not mean that it will be counted against you if you *do* write the trade name instead of the popular name of the ship. Thus, in such cases the contestant may either write "Spirit of St. Louis" on the answer blank or "Ryan N.Y.P."

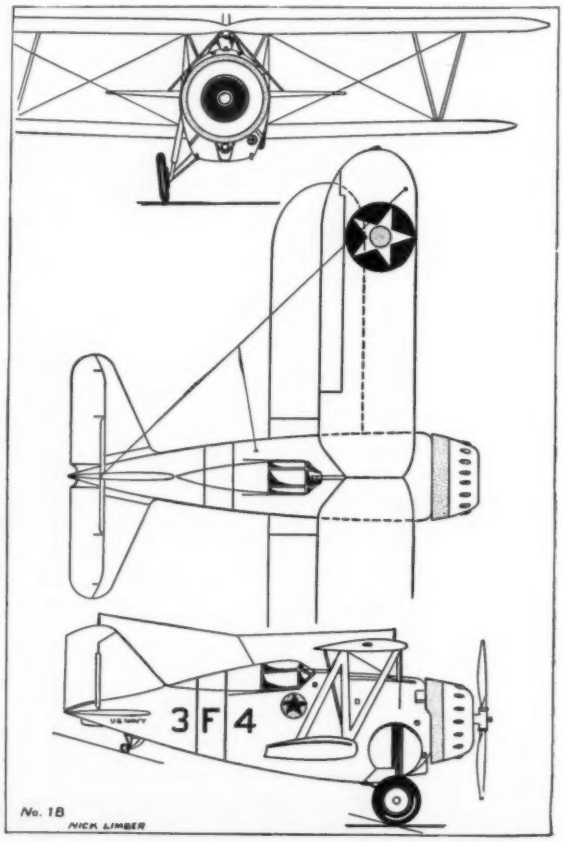
Another important item which cannot be overstressed is the fact that contestants must submit all three sets of answer blanks in order to be eligible for an award. Submitting only one or two sets of answers will not put you in the final line-up for the awards. One must answer *completely* each of the three sets, making certain that each set is mailed to us before the deadline.

To readers wishing to participate in the contest but who have not been able to get a copy of the previous issue of MODEL AIRPLANE NEWS we suggest that they communicate with us and purchase a copy directly from the office at 551 Fifth Avenue, New York City.

Note that under no circumstance whatsoever will we accept answers received after each deadline. Therefore get your copy of each issue at an early date and insure your chances for an award.

Another point which we must make clear in order that contestants might find solutions to the diagrams easier, is the fact that both American and foreign airplanes have been used in making drawings of the composite ships. Military as well as commercial and sportplanes have been used; therefore, keep a sharp eye while looking through your reference books. A little patience coupled with an average amount of knowledge of modern skycraft planes will see you through in flying colors.

Should you wish to communicate with the judges in case there is additional matters to be explained, address your letters to Contest Department, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City. However, first make certain that your question has not been covered in the rules and regulations or in any of the articles thus far published. A self-addressed,



Answer Blank for Diagram No. 1B

Insert name of plane to which the following parts belong.

Fuselage.....

Wing.....

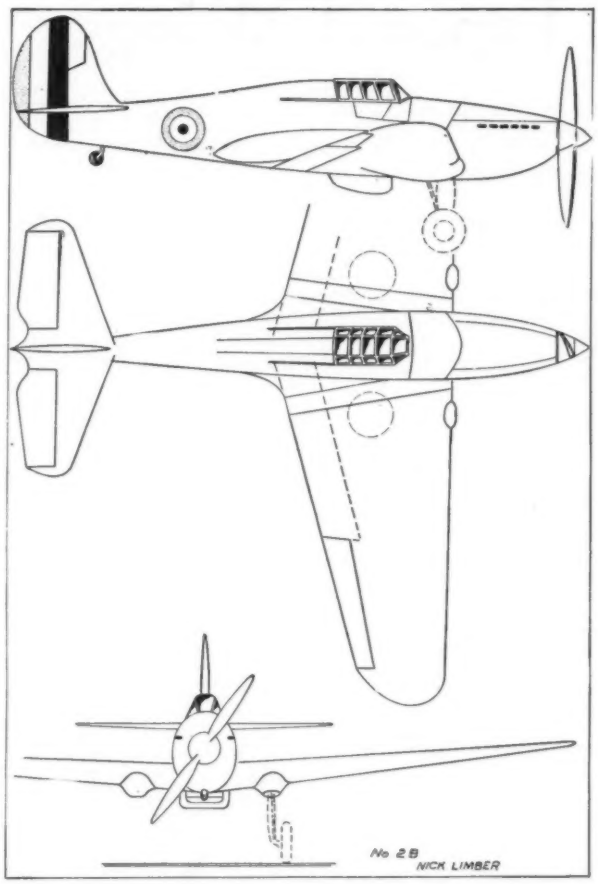
Rudder.....

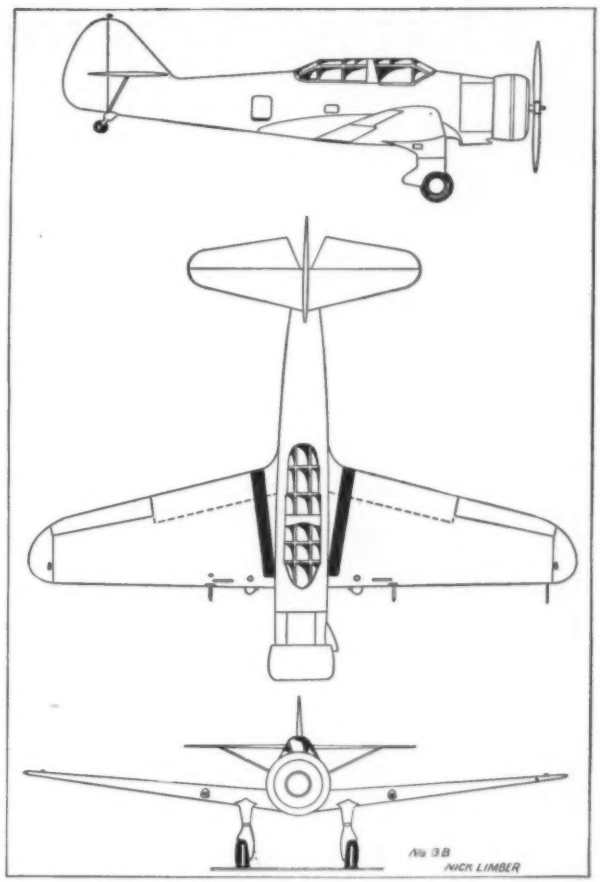
Elevators.....

Name.....**Age**.....

Address.....

City and State.....





Answer Blank for Diagram No. 2B

Insert name of plane to which the following parts belong.

Fuselage.....

Wing.....

Rudder.....

Elevators.....

Name.....Age.....

Address.....

City and State.....

Answer Blank for Diagram No. 3B

Insert name of plane to which the following parts belong.

Fuselage.....

Wing.....

Rudder.....

Elevators.....

Name.....Age.....

Address.....

City and State.....

stamped envelope must also be enclosed.

Rules and Regulations

1. Each month for three months a number of three view drawings of Hybrid airplanes will be presented. The contest started with a set of three plans in the August issue. Contestants must submit answers to all three sets of diagrams in order to be eligible for an award.

2. Answers for the first set of plans appearing in the August issue of MODEL AIRPLANE NEWS must be at the office of MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City, not later than midnight August 19th, 1938. Answers for this, the second set of plans appearing in the current issue of MODEL AIRPLANE NEWS must be at the office of MODEL AIRPLANE NEWS not later than midnight September 19th, 1938.

Each answer blank must bear your full name, address and age, printed clearly in the space indicated.

4. The judges are Mr. Charles H. Grant, Mr. George C. Johnson and Nick Limber. The decision of the judges will be final. Duplicate awards will be made in case of ties.

5. All answers submitted becomes the property of MODEL AIRPLANE NEWS and will not be returned.

6. The awards are as follows:

1st place	$10.00
2nd place	6.00
3rd place	4.00
4th place	3.00
5th place	2.00
6th place	1.00
7th place	1.00
8th place	1.00
9th place	1.00
10th place	1.00

JOIN THE BIG PARADE AND ENTER THIS CONTEST IT WILL HELP YOU TO KNOW YOUR PLANES

Plotting Ribs for Tapered Wings

A Concise Explanation Graphically Illustrated That Will Help You to Solve One of Your Most Annoying Problems

By FELIX GUTMANN

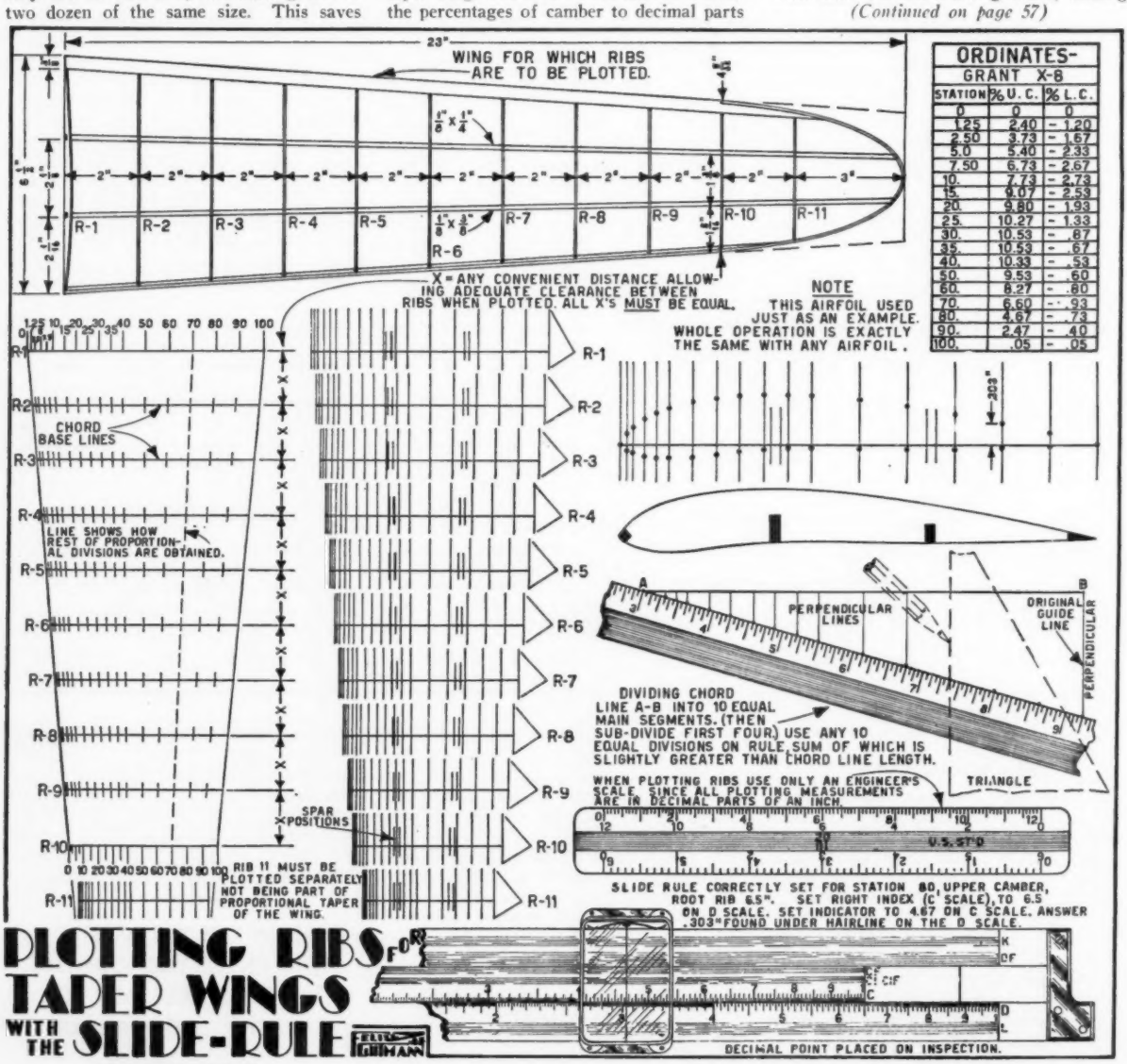
TODAY "box-car crates" are fast disappearing in favor of the scientific, outdoor, super-streamlined models. These models may represent a good deal more work, but builders evidently feel it worth the extra time and effort, knowing their labors will be well rewarded by a fine performer and teardrop "eye-catcher." Naturally to be sure of perfect results (or as near perfect as possible), one wants to use an airfoil which has already proven its worth. Such airfoils may be identical to those used for large airplanes, and they may be plotted by using tabulated data especially provided for the purpose of reproducing the particular airfoil to any size. Because of the tedious process involved in plotting an airfoil, many contestants use untapered wings on their entries, thus having to plot only one or two ribs, and making one or two dozen of the same size. This saves time and lots of energy, but at the same time that builder is depriving his ship of the desirable efficiency of a smooth taper wing. There are roundabout ways of making ribs for taper wings once the root rib, or root and tip ribs have been plotted. However, many of these are very inaccurate and the resulting airfoils will not have the same characteristics as those originally intended. Following is presented a system which is deadly accurate and which may save immeasurable time, both in the plotting of a single airfoil, or all of the ribs of a taper wing. The slide rule is used to convert the percentages of camber to decimal parts of an inch, to three significant figures. With this instrument a rib may be plotted top and bottom in about fifteen minutes, which is quick time.

Every serious model builder should be well acquainted with the slide rule, but anyone who can multiply two, three-figure numbers on the rule will have no trouble adapting it to the work here.

The drawing shows a typical taper wing and how ribs for it are to be plotted. The whole process is really very simple. Just the abundance of lines tends to belie this point. The work is as follows:

For the average rubber model up to about four feet, obtain a piece of strong, good quality tracing paper about 9" x 14". This should provide more than enough room. Of course for gas models a correspondingly larger piece must be obtained. Tack this onto the drawing board, holding

(Continued on page 57)


23"
WING FOR WHICH RIBS ARE TO BE PLOTTED.
R-1
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-9
R-10
R-11
X = ANY CONVENIENT DISTANCE ALLOWING ADEQUATE CLEARANCE BETWEEN RIBS WHEN PLOTTED. ALL X's MUST BE EQUAL.
NOTE
THIS AIRFOIL USED JUST AS AN EXAMPLE. WHOLE OPERATION IS EXACTLY THE SAME WITH ANY AIRFOIL.
ORDINATES-
GRANT X-8
STATION | % U.C. | % L.C.
0 | 0 | 0
1.25 | 2.40 | - 1.20
2.50 | 3.73 | - 1.67
5.0 | 5.40 | - 2.33
7.50 | 6.73 | - 2.67
10. | 7.73 | - 2.73
15. | 9.07 | - 2.53
20. | 9.80 | - 1.93
25. | 10.27 | - 1.33
30. | 10.53 | - .87
35. | 10.53 | - .67
40. | 10.33 | - .53
50. | 9.53 | - .60
60. | 8.27 | - .80
70. | 6.60 | - .93
80. | 4.67 | - .73
90. | 2.47 | - .40
100. | .05 | - .05
CHORD BASE LINES
LINE SHOWS HOW REST OF PROPORTIONAL DIVISIONS ARE OBTAINED.
SPAR POSITIONS
RIB 11 MUST BE PLOTTED SEPARATELY NOT BEING PART OF PROPORTIONAL TAPER OF THE WING.
.303"
PERPENDICULAR LINES
ORIGINAL GUIDE LINE
PERPENDICULAR
DIVIDING CHORD LINE A-B INTO 10 EQUAL MAIN SEGMENTS. (THEN SUB-DIVIDE FIRST FOUR) USE ANY 10 EQUAL DIVISIONS ON RULE SUM OF WHICH IS SLIGHTLY GREATER THAN CHORD LINE LENGTH.
WHEN PLOTTING RIBS USE ONLY AN ENGINEER'S SCALE. SINCE ALL PLOTTING MEASUREMENTS ARE IN DECIMAL PARTS OF AN INCH
TRIANGLE
U.S. ST'D
SLIDE RULE CORRECTLY SET FOR STATION 60, UPPER CAMBER, ROOT RIB 6.5". SET RIGHT INDEX (C' SCALE), TO 6.5 ON D SCALE. SET INDICATOR TO 4.67 ON C SCALE. ANSWER .303" FOUND UNDER HAIRLINE ON THE D SCALE.
DECIMAL POINT PLACED ON INSPECTION.
PLOTTING RIBS FOR TAPER WINGS WITH THE SLIDE-RULE
FELIX GUTMANN

Designing Your Gas Model "Prop"

(Continued from page 31)

area was accomplished in the case previously described by reducing the width. In this case both the diameter and the width must be reduced to retain the proportion of ($D=8\,W_B$).

The correct way to determine the proper diameter and blade width from the graph is by the trial method. First select a diameter that you believe will be approximately correct; for instance, twelve inches. On the graph the twelve inch diameter line crosses the (.42) cubic inch piston displacement line at a point which lies on dotted line No. 6. In the table under ten inch pitch in line, No. 6 column, the correct blade width for the available power is given as 1.6 inches. The diameter is 7.5 times this width, which value is close to (8). In the table, line No. 5 shows a (W_B) value of 1.4 and crosses the (.42) Cu line at a diameter of 12.5. In this case the diameter is nine times the blade width.

a distance from line No. 5 which is proportional to the difference in value between (1.53—1.4) = (.13) and (1.6—1.4) = (.2). Such a point taken on line Cu = 0.42 has a diameter value of 12.2. Upon testing these (D) and (W_B) values you will find that 12.2 is eight times 1.53. These are correct. Therefore, the diameter should be 12.2 inches, the blade width 1.53 inches, when the pitch is ten inches.

A table which should be very useful to builders who wish to have propellers of accurate design is shown below. This table gives the values of diameter (D) and blade width to use with various pitch values when $D=10W_B$. At the left of the table the power and cubic inch displacement of the motor is given that will be required to turn the propellers with the specified characteristics at 4000 R.P.M. This is the normal running speed for most motors.

How To Use The Table

In order that you will understand how to use the table correctly let us consider a practical example. The values given

DIAMETER = TEN TIMES BLADE WIDTH

PITCH		6 in.		8 in.		10 in.		12 in.	
H. P.	Cu	D	W_B	D	W_B	D	W_B	D	W_B
1/5	0.6	16.1	1.61	15	1.5	14.2	1.42	13.5	1.35
1/6	0.5	15.4	1.54	14.3	1.43	13.5	1.35	12.9	1.29
1/7	0.42	14.8	1.48	13.7	1.37	12.9	1.29	12.3	1.23
1/8	0.37	14.3	1.43	13.3	1.33	12.5	1.25	12.0	1.20
1/10	0.30	13.5	1.35	12.6	1.26	11.9	1.19	11.5	1.15
1/15	0.20	12.3	1.23	11.4	1.14	10.7	1.07	10.2	1.02
1/20	0.15	11.6	1.16	10.6	1.06	9.8	0.98	9.5	0.95

Table of (D) and (W_B) Values to use with various Pitches and Engine Powers

The correct diameter and blade width evidently lie between these two sets of values.

If a blade width value of 1.53 is chosen it will fall between lines No. 5 and No. 6, in the table are for propellers, the diameters of which are ten times the blade width. This proportion has been selected as it gives the best structural results, though lower blade width values may be used

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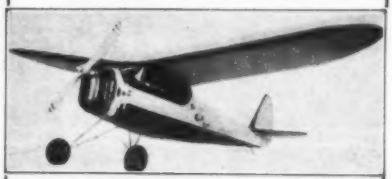

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⅛x⅛	30 for 5c
⅛x3/16	12 for 5c
⅛x¼	10 for 5c
3/16x3/16	8, 5c
¼x¼	6 for 5c
¼x½	3 for 5c
½x½	2 for 5c
1/64x2	4 for 10c
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1⅞	.07	.10 .16
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½x¾x6	6—5c
⅝x1x7	4—5c
⅝x1x8	3—5c
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6"	5c	15c
7"	6c	20c
8"	7c	25c
9"	8c	30c
10"	8c	35c
12"	10c	45c
14"	14c	55c
15"	15c	60c

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A problem presents itself to you in which you find that the propeller of your plane must have a pitch of nine inches. The engine upon which it is to be mounted has (0.42) cubic inches of piston displacement. Such an engine will develop approximately one-seventh horsepower. Now find the horizontal column in the table indicated by one-seventh horsepower at the left side. This is the third from the top. The pitches indicated that are nearest to (9) are eight and ten. The (D) and (W_B) values for a pitch of nine inches will be exactly half-way between the (D) and (W_B) values for eight inch and ten inch pitch. For eight inch pitch, D=13.7. For ten inch pitch, D=12.9. The diameter for nine inch pitch, then, is 13.3 inches. The blade width is exactly one-tenth this value, or 1.33 inches. Therefore for a one-seventh horsepower motor, the propeller should be 13.3 inches in diameter, the blade should have a maximum width of 1.33 inches and the pitch should be nine inches.

How to Determine the Power Required for a Finished Propeller

On many occasions a model builder will have some completed propellers on hand or he will wish to select a propeller from a number displayed in some store. In either case he will wish to know the engine power that will be required to drive any one of them at 4000 R.P.M. He may determine the exact power required for each one by means of a little calculation and the Power Required Chart.

How to Determine Pitch

The first step is to determine the pitch of the propeller. This may be done as follows:

Mark a point on the blade at a distance from the center of the hub or shaft hole of one-quarter the diameter. As an example let us assume the propeller is fourteen inches in diameter. The mark should be placed at a point on the blade 3.5 inches from the center of the shaft hole. Now at this point measure the width of the blade. Suppose it measures 1.4 inches wide. In the figure No. 135 this would be the width (AC). Now measure the depth of the blade at this point. This would be the distance (BC). We will assume that this measures half an inch. The pitch of the propeller now can be determined. The formula for pitch is:—

$$P = \frac{2\pi R(BC)}{\sqrt{(AC)^2-(BC)^2}}.$$

Substituting the numerical values for the symbols in the formula, we have:—

$$P = \frac{22(0.5)}{\sqrt{(1.4)^2-(0.5)^2}}.$$

Simplifying,

$$P = \frac{11}{\sqrt{1.96-2.5}}$$

$$= \frac{11}{1.31}, \text{ or } P = 8.4 \text{ inches.}$$

Thus we find that the theoretical pitch of the propeller is 8.4 inches.

The nearest value of the pitch indicated in the table at the right hand side of the graph is eight inches. The value of the blade width is 1.4. This lies between the value (1.5) shown in the fourth horizontal column under eight inches pitch, and 1.25 shown in the third column. The next step therefore is to determine what the blade width value would be in horizontal column No. 4 for a pitch of 8.4 inches and then what the value would be in column No. 3 for 8.4 inches of pitch. Then the exact position of the blade width value 1.4 may be interpolated between the blade width value for 8.4 inch pitch in column No. 4 and the value for this pitch in column No. 3.

First find the blade width for 8.4 inch pitch in column No. 4. For eight inches pitch, the width is 1.5. As the product of the two must be constant, and $(8\times1.5)=12$; then $\left(\frac{12}{8.4}\right)=1.43$; the correct blade width value for 8.4 inches pitch in column No. 4.

Next find the blade width value for column No. 3 at 8.4 inch pitch. For an eight inch pitch, the blade width value is (1.25). As $(8\times1.25)=10$, then $\left(\frac{10}{8.4}\right)=1.19$; the correct blade width value for 8.4 inch pitch in column No. 3.

It is necessary now to interpolate the position of (1.4) relative to the two values (1.19) and (1.43). The difference between the last two values is (0.24). Thus the blade width value (1.4) is $\left(\frac{21}{24}\right)$ the distance between (1.19) and (1.43), from (1.19). In other words, the blade width value line representing 1.4 of blade width

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for a pitch of 8.4 inches will lie close to line No. 4 on the graph, and between lines No. 3 and No. 4.

As the value is close to line No. 4, follow this line down to the left until it intersects the fourteen inch vertical diameter line. The line representing a blade width of 1.4 inches for 8.4 pitch will line on the fourteen inch diameter line, just below line No. 4. Actually it will be $\left(\frac{3}{24}\right)$ the distance between line No. 3 and No. 4, below line No. 4 on the fourteen inch diameter line. Such a point will be directly opposite a value of (0.48) cubic inch piston displacement in the power required column at the left side of the graph. You will note that the point is about three-fifths the distance between Cu line (0.45) and line (0.50), upward from line (0.45). This would indicate that the value of (0.48) cubic inches of engine piston displacement would be required to turn the propeller at 4000 R.P.M. A value of (0.50) is one-sixth horsepower. An engine of about this power therefore should be used with this propeller.

The foregoing procedure may appear to be tedious, however you cannot use too much care in selecting the correct propeller for your gas model. Carelessness in this respect will invariably destroy the potentially fine performance of an excellent plane. A poorly designed propeller in many cases will give only sixty per cent of the efficiency it is possible to develop with a propeller that is suited to the plane on which it is mounted.

Now that a method of determining the correct diameter, blade width and pitch to use with engines of various power has been explained, it remains to show how to calculate what propeller pitch is necessary for planes of various speeds and wing loadings. This important procedure will be outlined in the next issue of this magazine.

American Wings Across the Seas

(Continued from page 5)

man in the crew crawls way down into the fuselage by the elevator and holds the bolts from the inside while another mechanic loosens the nuts. The fin being an integral part of the fuselage, is not removed. At the end of the first day of work we have taken off all the smaller parts and have placed them in their respective crates.

Perhaps at this time we are expecting another DC-3 for K. L. M., which has not arrived, and from which no wire has been received telling the reason for the delay. The next morning on the way to work we read on the front page of our newspaper that the airliner has cracked up in the wooded, snow-capped Rockies of Arizona. We all gather in the office to receive our day's orders and to discuss the news article. Most of us knew the pilot and so it is a sad day for us. The pouring rain outside the hangar makes it seem worse. We have always thought that ferrying ships across the country is a cinch job but this crash has changed our minds. Still, we gather up our tools and start our work.

The second day's work on the ship sees the wings removed. With two mechanics working on top of the wing and two working below, the tedious job of removing about three hundred and fifty bolts begins. It is a slow monotonous task. After a few hours, when all but a few bolts are off, all hands gather around the wing to be removed. The wing is held with a hoist attached to the hangar roof and the remaining bolts are taken off. It is then lowered onto the shipping frame which is made of 4' x 4' and 6' x 6' lumber. The other wing is then taken off in the same manner. The carpenters then go around and cover, with carefully fitted plywood, the openings left in the fuselage and wings by removing the various parts.

While all this has been going on, those of us who have not been needed have been taping over every opening on all the parts of the ship. With blue, waterproof, adhesive tape we seal the plywood to the fuselage, and cover over every hole, no matter how small. The windows and windshield we tape around the frames. The only parts not taped are the baggage door and the door to the cabin.

The engines are cleaned, sprayed with light grease, covered with yellow oilcloth, and then a heavy canvas cover is placed over the cowl and the engine.

After most of the dismantling is done, four or five of us get out the spray guns and grease. For several hours we are busy spraying it on all the parts of the ship except the fabric covered control surfaces, to prevent corrosion from the salt water. This job takes anywhere from four to eight hours.

About thirty-five gallons of grease are used to spray a DC-3 thoroughly, and about twenty gallons for an Electra. As a last minute operation a mechanic wipes the grease off all the rubber parts such as tires and de-icers to prevent deterioration.

Two or three of us then drag out some heavy steel plates from a corner of the hangar. The plates are attached to the wing stubs, with heavy grease and tarpaper between them, to seal up that part and prevent corrosion of the wing stubs. These plates are used to hoist the plane. After the shipping number, destination, etc., have been stenciled on each part, the plane is ready for shipment.

A glance around the hangar shows us how the various parts are packed. The fuselage ((shipping part No. 1) rests on its three wheels. The right wing (part No. 2) lies in its bulky frame with no covering over it, but fastened securely. The rudder and several fillet sections may be seen on the floor of the frame. The left wing (part No. 3) is packed the same as the other wing except that under it are packed the wing tips and elevators. The stabilizer (part No. 4) lies on a long frame with no covering. The tail cone is attached to the frame also. Part No. 5 is the ailerons, which are packed in a long, narrow plywood box.

At high tide the sputtering old tractor again pulls the ship, this time by parts, to the seaplane ramp to be loaded on the "lighter." The tractor pulls the fuselage with a special tail-wheel fork. A mechanic is sitting up in the cockpit, riding the brakes and several of us walk beside the wheels with large chocks. Naturally, we do not want the plane to roll down the ramp into the water.

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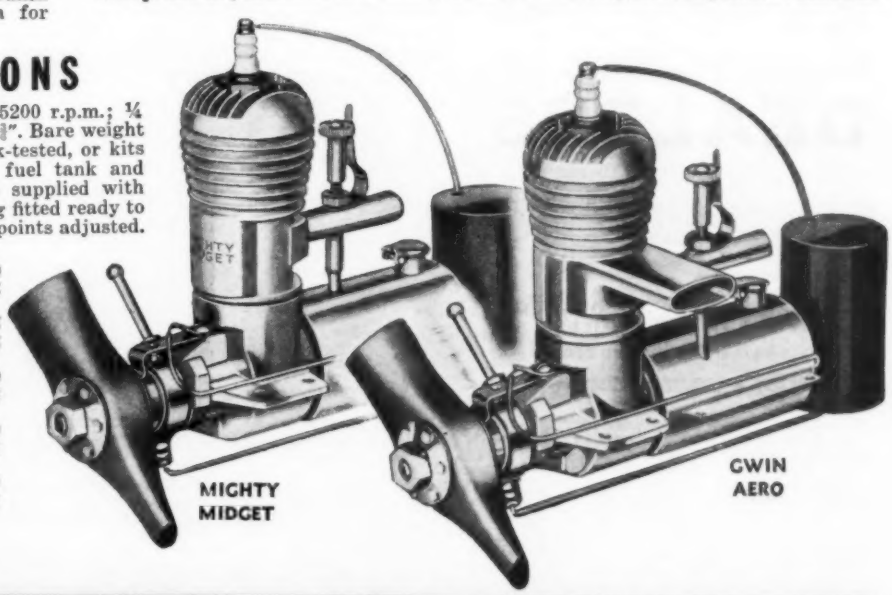

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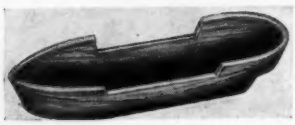

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The crane on the lighter first lifts the two bulky wings aboard while several mechanics are pulling the aileron case on. When it is time for the fuselage to be lifted aboard, the crane hooks up to it with the steel plates on the wing stubs. Four or five men hold guide ropes attached to different parts of the fuselage to keep it from swaying. In a high wind it is very difficult to do this. The wind seems to want to smash it against the crane base. To make it worse, sometimes the fuselage does not balance evenly.

When the plane is all aboard the squat tug slowly pulls the lighter to the steamer where the ship's huge crane lifts the parts of the plane aboard. Some of the crew then lash the plane to the deck and it is off on the second leg of its journey. The plane, capable of doing over two hundred miles per hour, plows across the Atlantic at fifteen knots!

Upon arrival at its destination it is a simple task to assemble the plane as most of the foreign airlines have American planes and their mechanics are thoroughly familiar with the construction. However, they will find that all parts are labeled to prevent any mistakes. We placed all the nuts, bolts, etc. in labeled containers. The flap rods, elevator balancers, etc. were also labeled.

After the plane leaves the factory it requires from two weeks to two months until it is in foreign service, depending upon the destination and the speed with which it is handled. One of the Grumman G-21's now going to Java will necessarily take nearer two months because of the poor steamship service and the roundabout route.

A DC-3 or DST can be dismantled in three and a half days with twelve men working on it, including carpenters; a DC-2 in about three days and an Electra in about two. Lockheed construction requires a slightly different procedure from that used on the Douglas. The carpenters put plywood over the open end of the wing stub instead of steel plates as the Electras have wing hooks built into the wing stubs. The whole empennage is taken off the Lockheeds.

One time we dismantled an Electra in a great deal less than the usual time. A Czeckoslavakian shoe manufacturer had purchased a Lockheed Electra and was flying it from the west coast to North Beach for shipment to his native country. However, while landing in a fog at Chicago it cracked up and was badly damaged. He could not wait to have it repaired and so he flew back to the factory and bought the next stock model off the assembly line, causing a delay of several days.

The Czeck headed his new ship eastward again and this time made a safe landing at Chicago. After taking a look at his wreck, he left for New York in the new ship, totally disgusted. The ship arrived at North Beach at 6:00 P.M. one evening last May. The Czeck said it had to be on the boat at noon the next day!

Could we do it? Two days work in twelve hours? We set to work immediately and worked until 5:00 the next morning. No expense was spared. The owner of the plane hired a shipping company and twenty-five carpenters to help make the crates which four men normally make. They arrived in a huge truck, together with the needed lumber, a few hours after they were called.

We worked under the glare of bright lights, faster than we had ever worked before. There were three carpenters hammering each nail and nothing was ever built as rapidly as those crates. Even as we undid screws and bolts, we noticed those crates spring up in minutes. Everything went fine and the plane was on the boat the next day with several hours to spare.

The company that does all this work is American Bluefriesveem, Inc. of 44 Whitehall Street, New York City, more commonly known as Bluefries. Some weeks it exports five or six planes abroad, to China, Europe, Africa, or wherever the destination may be.

I have only touched very briefly the conditions of the present export market. There are other planes, small private craft and large ones also, that leave our shores in an ever increasing flow. As the export market becomes larger, more planes will naturally be shipped. The field offers enormous possibilities. In the future the export business will be a large enterprise of its own, provided that it keeps increasing at the present rate, and therefore one which will be of more interest to the aviation public than it is at present. Today few people realize the importance of exporting and how the planes are shipped.

How to Build the Arado Trainer

(Continued from page 27)

cemented on. After cementing the landing gear struts in place securely, the 1/16" square stringers may be cemented to the sides of the fuselage, as shown on the plans. Cloth or masking tape may be used in covering the shock absorbing point in the landing gear, but the latter is preferable, since it can be removed for repairs on the landing gear in case of a dive or some other unexpected maneuver. If cloth is used, use cement to secure it in place; leaving it wrinkled a bit so it really looks like the leather "shoes" that are used on the original. The tail wheel does not have to revolve, so a dummy type carved from a hard piece of scrap balsa will do.

Tail Surfaces

The tail surfaces may be built in the usual manner, employing 1/16" by 1/8" strips for leading edge, trailing edge and ribs. In making a flying scale stabilizer and rudder, it will be found that both are better suited for warping in adjusting the model if they are both cut from a sheet of 1/16" thick balsa. They should be made the same shape as the built-up type, but the grain in the ribs should run spanwise. (See sketch on front view plate.) The propeller may be carved now and the prop shaft cemented into it. For a better glide, a proven free-wheeling should be used. This will cut down the parasite drag by a wide margin.

After forming the rear hook, cement it in place and cut away one of the stringers so that an open space is left to get at the rear hook when installing or chang-

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2	Travel Air Mystery	1.75	.50	
3	DeHavilland-4	1.95	.85	
4	Curtiss "Jenny"	1.65		
5	Laird Super-Solution	1.50	.50	
6	Foliah Fighter	1.95		
7	Curtiss Helldiver	1.95		
8	Army Boeing P12-E	1.50	.60	
9	Sopwith SE-5	.95	.40	
10	Sopwith Camel	1.25		
11	A-W Quad Fighter	1.25	.45	
12	Bishop's Nieuport	1.50	.50	
13	Rickenbackers Spad 13	1.50	.50	
14	Fokker Triplane	1.50	.50	
15	Fokker D-7 Fighter	1.95	.60	.50
16	Albatross D-5A	1.25		
17	Bayles' Gee-Bee	1.50	.50	
18	Howard "Pete"	.95	.25	
19	Supermarine S6-B	1.75	.65	
20	Hawker Fury Fighter	1.75	.70	
21	Hawk P6-E Fighter	2.25	.85	.50
22	Macon Fighter	1.50		
23	Boeing P-26 Pursuit	1.50	.60	
24	Lockheed Vega	1.95	.85	
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26	Heath Parasol	.95	.25	
27	Doolittle's Gee-Bee	1.50	.50	
28	Monocoupe Sport	1.50	.50	
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30	Nieuport 28 Fighter	1.50		
31	Hall Racer	1.50		
32	Boeing 95 Mail	1.50	.85	
33	Comper Swift Sport	1.50	.55	
34	Fokker D-8 Fighter	1.25	.45	
35	Boeing 247 Transport	4.85	1.95	
36	Lincoln Sportplane	.95	.25	

KIT NO.	NAME	SF ¾" Scale	D's ½" Scale	REPS 20" Span
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38	Buhl Bull-Pup	.95		
39	B-J P-16 Fighter	1.95		
40	Aeronca Sport	1.25	.45	
41	Vought Corsair V-65	2.25	.85	
42	Howard "Ike"	.95	.25	
43	Douglas O-38 Obs.	2.50	.85	
44	Page's Racer	1.50		
45	Martin Bomber	4.85	1.95	
46	Laird Solution Racer	1.50	.50	
47	'33 Wedell's W.Wms.	1.75	.50	
48	'34 Turner's W.Wms.	1.75	.50	
49	Curtiss F11C-2	2.50	.85	
50	Curtis Export Hawk	2.50	.85	
51	D.H. Comet Racer		.95	
52	"Mr. Mulligan"	1.75	.50	.50
53	Grumman F2F-1 Fighter			.50
54	Hughes Racer			.75
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61	Seversky Fighter	2.25	.85	
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40—Aeronca C-3 Sport

41—Vought Corsair

42 Howard "Ike"

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RS-4 Hia. Beaver Tail .65

BOX CARS

RB-1 NYC—40 ft. steel .40
RB-2 B&O—40 ft. steel .40
RB-3 B&O—40 ft. wood .40
RB-4 Rock Is. 40' wood .40
RB-5 Wabash—40' wood .40
RB-6 SP 40' wood furn. .40
RB-8 T&P 40' wood auto .40
RB-9 AT&SF 40' wood .40
RB-11 U. P.—50' steel .45
RB-12 AT&SF 50' st. auto .45

CABOOSE
RC-1 PRR type N-5 .40

FLAT CARS
RF-1 C&NW 46' 50 ton .25
RF-2 PRR 46' 50 ton .25
RF-3 B&M 46' 55 ton .25
RF-4 L&N 46' 50 ton .25

GONDOLA TYPE CARS
RG-1 L&N 41' 50 ton .35
RG-2 NYC 41' 50 ton .35
RG-3 MC 41' 55 ton .35
RG-4 T&P 41' 50 ton .35
RG-5 PRR 65' 70 ton mill type gondola .45

55 T. TWIN HOPPER CARS
RH-1 CCC&StL RR .35
RH-2 Missouri Pac. RR .35
RH-3 Southern Railroad .35
RH-4 Illinois Central RR .35

8000 GAL. TANK CARS
RT-1 Texaco—TCX (wh.) .35
RT-2 NATX (black) .35
RT-3 Sinclair—SDRX .35
RT-4 Gulf—CRCX (blk.) .35

19—Supermarine

20—Hawker Super-Fury

21—Hawk P6-E

23—Army Boeing P-26

27—Doolittle's G-B

29—Navy Boeing F4B-3

5001—Cleve. Amphibion

Big Reductions on Supplies, Too!

Send 5c at once for our complete catalog showing drastically reduced prices on the famous C-D line of Kits and supplies. Big savings—sensational values—many gas model supplies too. Gas model list extra, 3c stamp—little duplication.

★ A Real Surprise for Dealers ★

Send at once for C-D's "Back to Prosperity" proposition. Puts new life into lagging sales—and real money in the till. Don't wait—wire or write today sure.

Nothing Like C-D Gas Models and Supplies

Ideally Suited for Radio-Control Work

The two C-D Gas models are such great values it has been impossible for us to change the price of the kits which make up these two beauties. The Stinson Reliant pictured here available in model GP-66 (dry kit), post-free $8.50. The GP-69 Rearwin Speedster (dry kit) post-free $4.85. In accordance with our gas model policy the motor unit with propeller, wheels and wheel shoes are not supplied, to give model builders their choice on these items. Extra parts to complete GP-66 (except power unit) $3.95. Kit of extra parts to complete the Rearwin $3.55 (except power unit). Add $.85 to either parts kit if you wish 3¼ M & M's instead of wood wheels.

Brown Jr. Gas Motors

Model D Postpaid	$10.00
Model C Postpaid	17.00
Model B Postpaid	21.50
Br. Jr. Exhaust Manifold	1.00
Br. Jr. Spark Coil	3.50
Smith Coil	2.50
Lightweight Coil	1.45
1 Minute Timer (1 oz.)	1.95
AC Spark Plug ⅜-24	.65
Condensers (finest make)	.15
Toggleswitch	.39
Knife Switch SPST	.25
Tip Jacks	.09
Tip Plugs Solderless	.09
Bamboo Tissue 24x36	.08
Wheel Shoes, Balsa (3½ wheel)	.95
3½ M & M Pneumatic Wheels	1.50
3½ & 4½ M & M Wheels, pr.	2.75
3½x1⅝ Balsa Wheels, pr.	.65
½x½x1/16 Alum Angle, ft.	.15
⅝x⅝x1/16 Alum Angle, ft.	.20
12" Laminated Props (special)	.98
C-D Utility Props—9"—12-13-13½"-14", each	.59

—And many other parts. Pkg. & Shipng. charge 15c. Send 3c stamp for gas list alone, or 8c for both catalogs.

ORDERING INSTRUCTIONS: All direct orders subject to our regular shipping terms. Send check or M.O. (cash at own risk). No C.O.D.'s. To U.S. Possessions, Canada and British Isles, add 10% extra; all other countries, 20%, except those which have a "transit charge" then add 40%. Be sure to include 5c for our New Catalog, if you don't have a copy.

Cleveland Model & Supply Co., Inc.

4508-B-65 Lorain Avenue ★ ★ ★ ★ ★ ★ Cleveland, Ohio, U.S.A.

● REDUCTIONS RUN IN SOME CASES AS MUCH AS 33⅓%

IMP *PRESENTS* . . .

"THE SHARPIES"

Designed exclusively for model builders—A pair of permanent, keen double edged knives, in protective fountain pen type handle and cover—no extra blades to buy or replace—cannot slip out while working—in two sizes—No. 1 for fine or close work on Balsa and other light woods or materials. No. 2 for cutting and carving heavier woods, leather, linoleum, etc.

20c for both

(Add 10c to cover postage and packing)
DEALERS "The Sharpies" are mounted as illustrated, on 4x7 display cards.

THE ENDURO, JR.

24" WING SPAN

25c
plus 5c postage

Guaranteed to fly 200 yds. minimum. A new "Jiffy Kit" of a twin stick Endurance Model in which all the parts are finished ready to fly within one minute after you receive it. Wings and tail assembly formed, adjustable dihedral, fully finished 8" Paulownia Prop. (Retail value 16c). Shafts, landing gear, thrust bearings, washers, tailskid, paper and instructions for endurance and stunt flights—A Real Flyer—Indoor and Out.

SOME NEW GAS MODEL PROPS

Made in our Brooklyn Plant—these new *5 Ply Laminated* and Central American Mahogany Propellers will enhance the beauty and increase the efficiency of your gas model—High Gloss Lustre Finish.

L1—5 Ply Laminated

10" } 10" only is 3 Ply
12" } $1.00 each P.P.
13" }
14" } $1.25 each P.P.
15" }
16" } $1.50 P.P.

M1 or M2—Mahogany

10" } 10" only is Gum Wood
12" } 65c each P.P.
13" } 75c each P.P.
14" }
15" } 90c P.P.
16" } $1.25 P.P.

Propeller Blanks for those who want to carve their own—correctly tapered and drilled.

5 Ply Laminated	Mahogany
10 to 13"—50c each	10 to 13"—25c each
14 to 16"—60c each	14 to 16"—35c each

Plus 5c for postage

HIGH Class Necessities at Special Summer LOWS

Impaero Bamboo Paper A real high quality in correct weight 24x36"—natural color—3 sheets 15c.

Impaero Model Silk The finest obtainable for Gas Models. Regular weight (3½Mm) 50c per yd.—Extra heavy weight (5Mm) 60c per yd. Regular weight in red, blue, yellow, khaki or brown 60c per yd.

Imp Free Wheeling Set For rubber motored models—fits all types of propellers—this is the original and first perfect device—consisting of special shaft, two roller brass cup washers and brass engaging attachment for prop—guaranteed to work perfectly—10c each.

"Lustroid"—colored dopes A new Imp formula that gives the professional high gloss finish to wood, paper, silk or other fabrics. No high gloss finisher needed when using "Lustroid"—Colors—blue, red, cream, yellow, khaki, green, silver, white and black. **2 oz. can, 15c ea., post. 5c 4 oz. can, 25c ea., post. 5c**

Imp Celluloid Motor and Drag Ring Combination at new low prices. **1½", 10c; 2", 15c; 3", 20c**

Note—All of the above Imp Products are on sale at leading department and specialty shops—if unable to obtain, send direct to us—No C.O.D.s—Minimum order 50c.
Send 10c for catalogue, charts and guide of propellers, model airplanes, boats, tools, trains, etc.

INTERNATIONAL MODELS
251 West 55th St., New York City, N. Y.

ing the rubber motor. Do not forget to cut away the tissue at this point after the fuselage has been covered and doped.

Construction of the Wing

Cut both the right and left wing panels from the plans and cement together, so that the entire wing may be built in one unit. If you care to preserve the plans, trace the wing plan onto a separate sheet. The leading and trailing edges of the wing are held on the plans with the use of pins or drops of cement. Before cementing in the ribs, make sure that you understand how they are made. A look at the photographs of the uncovered model will show you. The bottom part of the rib is plain 1/16" square, but the top is cut from 1/16" sheet balsa, with the aid of a template. A cardboard template will serve the purpose, but a brass or aluminum one will be found to be more durable. 1/16" square reinforcements are used inside the wing where struts are cemented to it. These reinforcements will transmit the shock of landing or hitting on a wing-tip to other ribs, so it is best to include them in the model. Quarter-grained stock should be used for the wing tips, as it resists warping easily when the wing is covered and doped. Quarter-grained stock is easily recognized because of its speckled appearance. (You've surely noticed that some balsa sheets had that appearance, and probably wondered what it was due to.) Use it on parts of the model that are apt to warp, as it is stiff and retains its shape.

After the cemented joints of the wing have dried, crack the wing at the proper points for dihedral. Reinforce the break with a coat of cement. After covering the parts, assemble the model, taking care to see that the tail and wing are both at the right incidence. The rudder should be offset slightly for a right turn, so that the model will fly in right spirals. When assembling the wing onto the fuselage, cut a small jig from scrap sheet balsa so that it conforms with the space between the bottom of the wing and the top of the fuselage. Hold this jig in place on the fuselage with two pins, and pin the wing down to the top of the jig. With the wing so secured, fit the struts in by the "cut and try" method.

Doping

After doping the model with one coat of clear dope, sand all the parts with the finest sandpaper or emery cloth that you can obtain. Dope the whole model silver. After it has dried add the black details, such as motor exhaust port, wheels and air inlets on the air scoops. The control surfaces may be drawn in with a ruling pen, such as is used for drawing; or else strips of black tissue may be carefully doped or cemented on. The simplest way of making the insignia on the rudder is as follows: Dope the red band around the rudder, and while the dope is drying, cut a circle from white paper. On this circle, draw a black swastika in India ink. After it has dried, cement or dope the circle in the middle of the red band around the rudder. Letters cut from black tissue and doped onto the wing complete the color scheme.

Flying

The model flies well on two loops of 1/8" flat rubber, but as wood in various localities varies in weight, three loops might have to be used. Using lubricated rubber and a winder, 750 turns may be given the motor without fear of breakage. If you do not use "lube" and a winder, don't give the motor more than 500 turns; as a motor that is not lubricated cannot take very many turns. The duration of the original model was from 30 to 40 seconds, but much more time than this can be made as the author did not attempt to give the motor full winds. After finishing your model, take a picture of it and send it in to the "Air Ways" column, won't you? For the information of those interested, the action pictures of the model were taken with an ordinary folding camera with the shutter set at its largest opening and fastest speed (f 6.3—1/100th second).

Frontiers of Aviation

(Continued from page 23)

of six of the boats during 1939, and in the recent expansion bill $3,375,000 additional was appropriated for nine more of the huge four-engined patrol bombers. Of course Sikorsky may get some of this.

Douglas's giant, the DC-4, and the new Boeing flyingboat made more aviation history when they both took off on the same day for their maiden voyages. The Boeing had a little bad luck when it stove a hole in one of its sponsons by hitting a log in the water. The damage was only slight. Douglas had more success and the first flight lasted for over two hours, which is a surprisingly long time for a first test flight. Results of test flights since have been very satisfactory. The giant airliner has been going up almost daily to rush tests along so Douglas can get under way with production and cop that order for fifteen to twenty-five DC-4s that United Airlines is contemplating. It looks as though Boeing is not going to be so far ahead of Douglas in tooling up their plant for the production of their big airliners after all.

After taking off from Douglas' field at Santa Monica, California, the DC-4 landed at the Los Angeles Municipal Airport (Mines Field) and joined the host of other planes now undergoing tests for their ATCs. Pasped, Aeroneer and Max Harlow all have improved planes on test there for the observance of Bureau of Air Commerce officials. Max Harlow's all-metal sportplane that survived a flat, pilotless spin into the ground has added more area to the leading edge of the fin to insure no more of those flat spins.

Also on hand is Northrop's latest dive bomber for the navy . . . just like the BT-1 except for a landing gear similar to the retracting ones on the army's Northrop attacks. Vultee's latest attack, which incidentally is for our own air corps competitions, paid a visit over Mines Field on its first test flight. It has a twin-row radial engine in the nose and looks very fast.

PERFORMANCE PREFERRED . . .

If you want a model that performs like the most modern aircraft, build a Berkeley-Designed gas model. You will find the same thrills as owning and flying your own 1000 hp. pursuit ship. Some pilots say that it is even a bigger thrill flying a Berkeley model. When you buy a Berkeley kit you not only get full value for every cent you spend, but the "hidden value" of built-in performance, stability, and rugged construction; an airplane designed as only Berkeley can design it.

The Latest Berkeley-Design

"COURIER-SPORTSTER"

6-Ft. Wingspan—High Performance Model
For 1/6 to 1/4 hp. Motors

The new ship that is "tops" in gas model design and performance. Designed by the designer of the famous "Buccaneers," this ship is expected to surpass the records of this great line of gas models. You will like its sleek lines and sweep-back gull wing. The motor can be installed either upright or inverted.

The kit has the completeness of all Berkeley Gas Model Kits. Full-size detailed plans with three dimension sketches of all the construction. All wooden parts printed out. Hardware and ignition equipment. Large can of cement and colored dope. (Your choice of color). Complete kit less wheels and power plant $5.95 P.P. in U.S.A.

$5.95 P. P.
Less Wheels and Power Plant

THE NEW "CUSTOM CAVALIER"

"The Aristocrat of Model Airplanes"

9 ft. Wingspan
Simplified MONOCOQUE CONSTRUCTION for ¼ to ½ h.p.

On a 30-second motor run this sensational model flew for 1½ hours at Seversky Field, L.I., on April 3rd. Perfect for radio-control. Kit is complete, even to silk for covering, "pearlene" dope, and all wood printed out. Everything to build the model as pictured, except power plant and wheels..... **$15.00 P.P. in U.S.A.**

CONTEST FLASH!!!

"Custom-Cavalier" Flies 29½ Minutes On 30-Sec. Motor Run at Detroit Nationals.

Officially timed for 144¾ minutes before disappearing from the airport, the "Custom-Cavalier" captured second place in the National Open Championship Meet. Actually the plane was in the air 201½ minutes, more than four times as long as any other commercial gas model.

The "Super-Buccaneer"

I.G.M.A.A. RECORD BREAKER

57½ Minutes Official or 2 min. engine run
7½ ft. Wingspan

$8.50 P.P. in U.S.A.

Since its introduction a year ago, this super-ship has won over 15 "Firsts", and one hundred other prize-winning places in major contests throughout the country. No model engine is too powerful for this sturdy ship. The more power, the higher the performance.
Kit includes: Full size plans; wooden parts printed out; hardware and ignition equipment; pint cans of cement and colored dope; everything to complete the model as pictured except wheels and power plant.

The "BUCCANEER-STANDARD"

Official N.A.A. World's Record Holder
Undisputed Limited Engine Run Champion

5½-Ft. Wingspan. For 1/6 to 1/4 hp. Motors

Harold Johnson of the Queen City Gas Model Club not only won the Quaker City Championship (Second consecutive year for the Buccaneer-Standard), but also second place at the Kresge meet. To top this fine record his "Buccaneer-Standard" won the Trenton N.A.A. Meet, setting a new official world's record for limited engine run. At this meet other "Buccaneer-Standards" captured three out of the first four places. Add to this, the fine performance in nearly every contest in the country and you have the undisputed champion,—the "Buccaneer-Standard."

Everything you desire in a small high-powered gas model. Beautiful lines, easy construction, snappy performance, and, best of all, a custom gas model priced with the lowest mass production kits. No kit at even several dollars more can compare with it for completeness. Full-size plans. Hardware and ignition equipment. All wooden parts printed out. Large can of cement. Three colors of dope. (Your choice of colors.) Complete kit less wheels and power plant. $5.00 P.P. in U.S.A.

$5.00 Prepaid in U.S.A.

Complete Kit
Less Wheels & Power Plant

BERKELEY APPROVED MOTORS AND ACCESSORIES

BROWN JR MOTOR

Model "D"
$10.00 P.P.
Complete
READY TO RUN
With Coil & Condenser

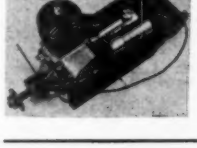
Full ⅛ h.p. with power to spare. Backed by the famous Brown Jr. Name and the Berkeley Approval. The only unconditionally factory guaranteed motor in its price class. **60 Day Guarantee.**

MODEL "B" Now rust-proofed for your protection..... **$21.50 P.P.**

MODEL "C" Now rust-proofed and mounted on skids..... **$17.00 P.P.**

NEW!! M & M 2⅝" Gas Model Wheels
ONLY 90c Pr. P.P.

IMPROVED OHLSSON GOLD SEAL MOTOR



Newly improved model with extra long crankshaft for longer wear. Easier to cowl. New patented transparent tank and mono-steel piston. Develops over ½ h.p. Immediate delivery from stock.

$18.50 P.P.

NEW!! OHLSSON SMALL BORE MOTOR

⅝" Bore x ¾" Stroke—1/7 hp.

The first "Berkeley-Approved" small bore motor, designed to Berkeley's specifications. Weighs only 4½ oz. yet develops almost as much power as some engines twice as heavy. An exceptionally low price for a quality engine. **$16.50 P.P.**

THE BERKELEY "STOP-WATCH" FLIGHT TIMER

We sold hundreds of these fine instruments at $3.00. Now we can sell this precision timer at only $2.00, absolutely the lowest price for a timer with stop-watch accuracy.

NOW $2.00 P.P.

OHLSSON WHEELS

3½" $1.50 pr. P.P. **4½" $1.75 pr. P.P.**

BERKELEY PROPELLERS

Standard propellers are mahogany stained and varnished. DeLuxe Propellers have metallic finish. Every propeller is perfectly balanced by new machine method.

	Standard	DeLuxe
12" dia. (8" or 10" Pitch).....	$ .60	$1.00
13" dia. (8", 10", or 12" Pitch).....	.70	1.15
14" dia. (8", 10", or 12" Pitch).....	.75	1.25
15" dia. (8", 10", or 12" Pitch).....	.85	1.35
16" dia. (8", 10", or 12" Pitch).....	1.00	1.50

BERKELEY MODEL SUPPLIES

"First in Gas Models"

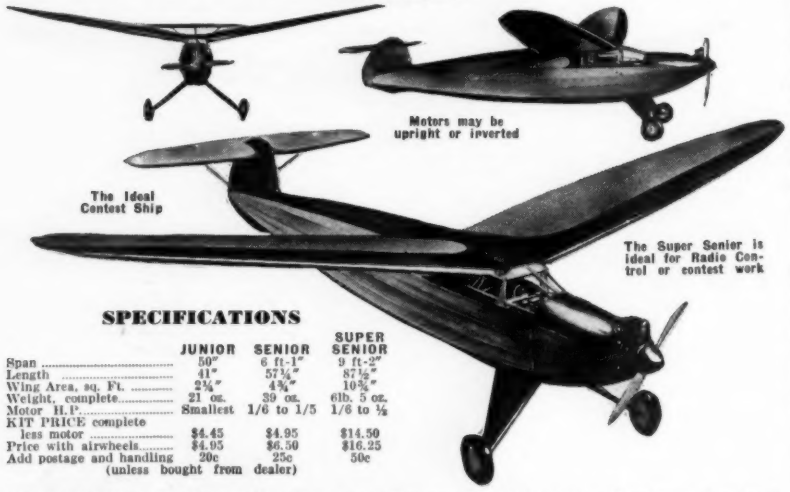
230 Steuben St. **Dept. U-39** **Brooklyn, N. Y.**

Over in England, Short Brothers has flown its new four-engined patrol bomber which is a direct development of the Short Empire boats. The new patrol ship has even a better appearance than the Empire boats, if such could be possible. A gun turret is located in the bow, amidship, and in the tail aft of the rudder . . . the same general arrangement as on our boats. The Short boat puts England right up there in the lead with us.

The sportplane manufacturers have been forging ahead. Though the financial outlook does not look any too promising they are making progress. Larry Brown, for one, has been pushing forward with his new sportplane in fine shape. The airplane is now about ready to take the air. It is a high-wing cabin monoplane with light steel tubing fuselage and wood wing. The wing is of two-spar design with a slight taper, and has Handley-Page slots and flaps with the link arrangement, instead of sliding on runners, as on the former Brown B-3 and the new Timm transport. A small Lambert engine is in the nose, and we should see a very excellent little sportplane take the air shortly.

What the sportsman wants more than anything is a light amphibian, and that is more difficult than any other type of plane to design. The Spenser-Larsen concern, however, has put their best efforts into designing an amphibian that will really perform and which will be offered at a price within the realm of reason. The company's first product has shown very careful workmanship and an extensive study of design. Radical as the plane is, its practicality is not too questionable. The plane looks good. In designing an amphibian you must consider that the airplane will require a quick take off from small lakes and such, which most likely means a small wing loading. But then a small wing loading means low speed, and what the sportsman demands is high speed. You have your troubles there and to strike a happy medium is more difficult than one might imagine. There is all that heavy additional amphibian gear mechanism that has to be lifted, which amounts to a great deal on a small airplane. With low horsepower a very sleek hull must be designed to eliminate as much as possible the "sticking" trouble in take offs. Yes, the designer certainly has his troubles in designing a light amphibian and may we present here the very latest in this type. We should keep in touch with this plane's progress with a watchful eye. Spanning all of forty feet the wing is full cantilever and of very sleek taper. It is all-wood and plywood covered. Likewise the hull. Synthetic enamel is used as the outside paint job with Bakelite varnish as the protective coating on the inside. The hull is developed from N.A.C.A.'s two-step model 35. Forward of the wing in a glass enclosed structure sit the pilot and passenger, side-by-side, with unusually good visibility. The radical features of the airplane are that the four-cylinder Menasco engine is located in the hull with a shaft projecting from the top of the hull to hold the propeller. This feature gives the prop high efficiency. It helps also to concentrate the weight near the center of gravity. At this point it will be away from the spray as much as pos-

"THE PROFESSOR"—A Championship Design in 3 sizes.—K. Ernst, dealer and model builder of 10 years experience states: "Most outstanding ship for STABILITY, SOARING ABILITY, and SHEER BEAUTY"



SPECIFICATIONS

	JUNIOR	SENIOR	SUPER SENIOR
Span	50"	6 ft-1"	9 ft-2"
Length	41"	57¼"	87⅛"
Wing Area, sq. Ft.	2¼"	4¾"	10⅝"
Weight, complete	21 oz.	39 oz.	6lb. 5 oz.
Motor H.P.	Smallest	1/6 to 1/5	1/6 to ⅛
KIT PRICE complete less motor	$4.45	$4.95	$14.50
Price with airwheels	$4.95	$6.50	$16.25
Add postage and handling (unless bought from dealer)	20c	25c	50c

EASIER TO FLY—Special (only on Korff Kits) slow stalling wing tips (NACA 6412 airfoil)—Approx. 8 oz./sq. ft. wing loading—Low center of lateral area in line with center of gravity—high line of thrust.

MORE EFFICIENT—Fuselage of elliptical cross-section—expertly streamlined—elliptical planform wing—NACA 4512 airfoil (soaring section)—Low drag motor cowl—Special "T" section tail surfaces eliminates "blanketing effects"

PRACTICALLY CRASH PROOF—New type free-swinging, detachable wing (rubbers fully enclosed) Soft balsa nose spinner protects motor—Flexible landing gear.

EASIER TO BUILD—Greatly simplified methods of construction—Many finished parts—Easy to read, full size plans—fully illustrated notes and details.

KITS ARE COMPLETE—Cutout and notched ribs, wing tips, and formers;—turned balsa spinner for propeller;—all strip and sheet balsa cut to size and of finest quality;—plenty of material for battery box, motor mount, and other details;—landing gear and tail skid wire;—wheels;—celluloid for windshield;—toggle switch;—wiring;—hardware;—bamboo paper;—cement;—banana oil;—clear and colored dopes;—Easy to understand, full size drawings, clearly illustrated.

PLUS—"*Testing Gas Models and Stability Facts*" written by an Aeronautical Engineer.

NOW—IT COSTS NO MORE TO HAVE THE FINEST IN GAS MODELS

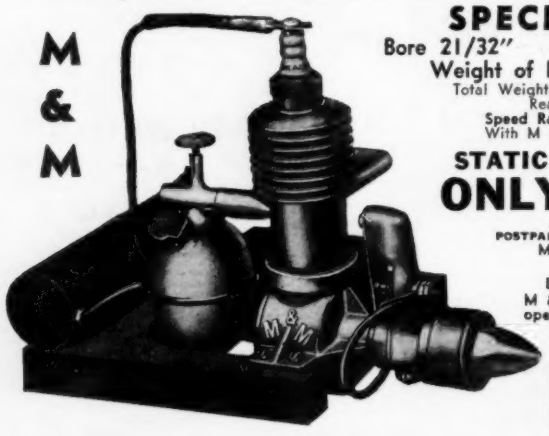
THE **KORFF** CO. **Dealers: Write for attractive proposition on company letterhead.**

607 EAST 39TH STREET INDIANAPOLIS, INDIANA

Sensational High-Powered Small Bore Motor

OPERATES ON NEW M & M 2-4 VOLT PEN-CELL COIL

Built for Power and Performance and Not to Meet Competitive Prices



SPECIFICATIONS

Bore 21/32" Stroke 22/32"

Weight of Bare Motor 3½ ounces

Total Weight, Motor, Coil, Gas, 7½ ounces

Ready to Run—Less Prop

Speed Range 500 to 12,000 R. P. M.

With M & M Special Designed Prop

STATIC THRUST 20 OUNCES

ONLY $17.50 Postpaid

Complete and ready to run.

POSTPAID TO ALL FOREIGN COUNTRIES

M & M Special Designed Prop $1.00 Extra Postpaid.

Exhaust Stack $1.00 extra. Postpaid.

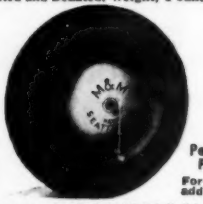
M & M Special 2-4 volt coil designed to operate M & M motors on 2 pen-cells. Will also operate all larger motors more efficiently. Price $3.00 postpaid.

Obtain M & M Products from any Progressive Dealer or send to Us.

M & M's NEW 2⅝" WHEEL

Designed for SMALL GAS MODELS

Can be Inflated and Deflated. Weight, 1 ounce per pair



ONLY $0.90 Per Pair—Postpaid

For Air Mail add 17c

M & M 3¼" GAS WHEELS $1.50 P.P.

For Air Mail Add 21c

M & M's FOR LARGER GAS MODELS

3½" & 4½" Gas wheels—weight 2½ and 5 oz. per pair.

Now only $2.75 per pair, postpaid

Size 6"x1⅞". Price $4.50 per pair P.P.

M & M Super Heavy Duty Wheel for Rubber Powered Models

SIZES 1¼—1⅜—1½—1⅝"—PRICE $0.50 Per Pair, Postpaid.

SIZES 1⅞—2—2⅛—2¼—2⅜—2½—2⅝"—and Special Designed DoNut Wheels. Size 1¾"—PRICE $0.60 PER PAIR. POSTPAID. For Air Mail Add 11c.

All M & M Wheels can be inflated & deflated. If located in Washington add State Tax.

Dealers: Our New Discounts Are Very Attractive.

Builders—Send for Free Illustrated Literature.

M & M MODEL WHEEL CO.

325 North 79th Street Seattle, Wash.

sible. Another unique feature is the rear wheels located in the aft part of the wing floats. The rear of the floats lower when the plane is to be landed on the ground. A nose wheel retracts completely in the bow of the hull.

A flywheel with automotive starter-ring gear is used to start the Menasco engine. A flexible spline shaft connects the engine to the two-shaft transmission which runs to the propeller. Encased in a steel box the engine will not be a fire hazard.

The length is 26 feet, 1¼ inches and the height is 8 feet, 10 inches.

Gross weight—2,200 pounds.

Weight empty—1,600 pounds.

Useful load—600 pounds.

Fuel capacity—30 gallons.

Oil capacity—3 gallons.

Engine—125 hp. Menasco C-4 developing 2,175 revolutions per minute.

Another new sportplane in the preliminary stages is a twin-engined pusher designed by Forrest Newman with exceptionally clean lines. The engines are set in the full cantilever wing with air scoops in the leading edge for cooling purposes. A nose wheel is also incorporated.

Among racing planes, the latest at this writing is Keith Rider's new little Menasco powered plane featuring the new molded wood fuselage. It is a very fast airplane and though it was completed before the past Oakland Air Races it was not sufficiently proven to take place in the events. A low winger, it resembles former Rider racers. Marion McKeen's old "Miss Los Angeles" presented itself all decked out in a new full cantilever wing and retractable landing gear.

Roscoe Turner gave Earl Ortman a hard-fought battle in the big feature race at Oakland but Ortman came home to win in his Keith Rider racer adorned in a bright yellow and black paint job. Turner's ship has had pants added to the wheels as the only noticeable change in appearance.

Russ Chambers, who was reported as one of the first to crack up at the National Air Races last year, was present with his own special job powered by a four-cylinder Menasco engine. It is of high-wing design with the small wheels retracting into the side of the fuselage. A very fast ship it is.

For the coming National Air Races look for a Curtiss Conqueror powered mid-wing racer built by Pearson and Williams, also two new ships designed by Tom Floyd and new Wittman and Elmendorf racers.

How to Build a Model of the Hawker Hurricane

The Hawker Hurricane is England's fleetest pursuit plane and is one of the fastest in the world. If you wish to square off the plans making them easier to measure, connect the corresponding marks on the border with straight lines. Each square will be equivalent to one square foot.

The model is to be built of balsa wood and the amount of detail put into the model depends upon your experience. These instructions will pertain to those who are beginners, and it is better that you build a solid scale model as your first undertaking.

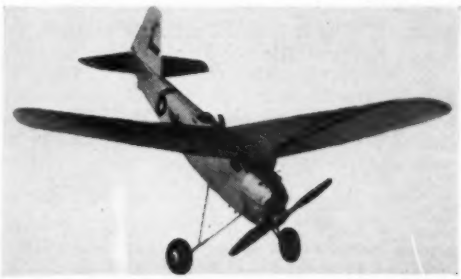
Get your dimensions from the plans and purchase the stock at any department store or model company. When buying the wood get a tube of model cement and small cans

MODELCRAFT Special of the Month

1939 PACIFIC ACE GA

New throughout, with latest improvements in design and construction. Has a high thrust line and upright engine. Flying weight 3 lbs., 4 oz. Can be powered with Ohlsson, Brown, Dennymite, or other engines of same power. Wing span 66 in., tapered from 12 to 5½ in. The wing is removable. Rudder adjustable with positive lock. Kit contains formed landing gear, formed aluminum (Orwick) cowl, die-cut ribs, inflatable air wheels, hook-up wire, cement, dope, complete **$8.50**

Dry kit same as above without cement, dope, silk or wheels **$4.75**



THE NEW 1938 SCOUT

A Big Ship For Powerful Flying Powered by Midget, Dennymite, Cyclone, Ohlsson or Brown engine. The Scout is new throughout with 60" tapered Clark Y wing, new design, and parts with latest improvements. Kit contains formed landing gear, ready-cut ribs, formed face plate and cowl, switch, hook up wire, cement, dope, silk, full sized plans and Voit air wheels. Only **$7.25**

Prepaid in U.S.A.

Special money saving deal: Kit, Timer and Ohlsson engine ..... **$25.00** SAVE $2.25

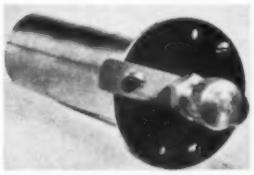
Same kit with bamboo paper and rubber Donut wheels **$4.85**

Dry Kit: No cement, dope, covering or wheels **$3.75**

THE FALCON

POWER WITH BRAT, TROJAN, HUSKY, ELF OR CHUNN ENGINE. Boys, here is the plane for you. Easy to build, and flies smooth as a Gull. 38" tapered wing. Kit complete with cement, dope, wheels, covering, printed ribs, formers, etc. **$1.50**

Deluxe kit with Traxler air wheels and silk covering **$2.95**



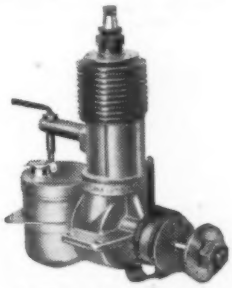
NEW FLIGHT TIMER

Adjustable from 1 second to 1 hour. Weight ⅝ oz. Accurate, reliable. Complete to drilled mounting holes. Ready to attach wires and install in ship. The first dependable timer made just for models.

$1.25

BROWN JR. MOTOR

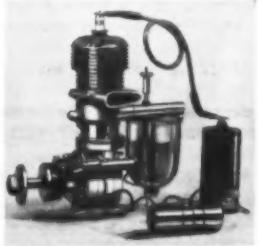
MODELCRAFT has been appointed Western Distributor for Brown Jr. Motors and will now carry a complete stock of motors and parts.



Model "D" $10.00

Complete ready to run with coil and condenser. The New Sensational Brown Jr. Model "D" at the low price of **$10.00**

Model "C" $17.50
Model "B" 21.50
Model "M" (Marine) 15.00



1938 OHLSSON ENGINE
1/5 H. P. $18.50
A high-powered unit

SOGARD PROPELLERS

49c

9", 12", 13", 13½", 14"

Yes, this same high-quality Sogard Propeller is sold at an amazingly reduced price. It is the prop with true pitch, accurate balance, maximum thrust and minimum torque. Take advantage of this sensational offer. Order today!

MODELCRAFT

7306 S. Vermont Ave., Dept. C, LOS ANGELES

THE LEADING SUPPLY HOUSE OF THE WEST

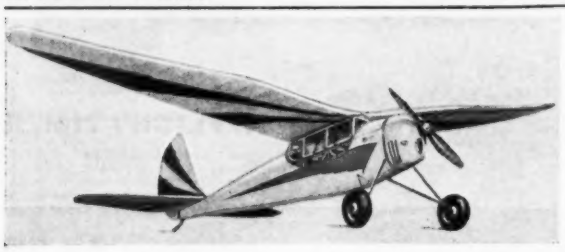
HERE IS PROOF FRIENDS THAT THE NEW "HUSKY JV" IS O. K.

A Large Eastern Dealer recently received (12) "HUSKIES" and immediately ordered (24) more—When you spend your money for a "HUSKY" you are buying the most Dependable Quick Starting small motor on the market.

The New "Auto Type Snap Spark Ignition" Starts the "HUSKY" Right Now—This new feature does away with the breaking of the stiff old style upper spring used on the Husky Jr. Also you don't have to dismantle the timer to clean and adjust the points, which can be done in a few seconds. We guarantee the "Husky" to give you 100% satisfaction.

The NEW "HUSKY" runs Equally as well Upright or Inverted and was Designed to Fly Models Weighing from 16 oz. up to 3½ lbs. The "HUSKY" will run Steadily at any Speed from 250 R.P.M. to 6000 R.P.M. using either a 11" or 12" Prop. The NEW "HUSKY" is BEAUTIFULLY FINISHED THROUGHOUT—It is BUILT to WITHSTAND any TEST it is put to—Each motor is THOROUGHLY TESTED, RUN IN and FULLY GUARANTEED to GIVE you Consistent Performance and LONG LIFE. ⅝" bore, ⅝" stroke. Wt. ready to run 6½ oz. Including two pancelia ror Current.

We are going to see to it that every HUSKY owner will be completely satisfied and a hundred per cent booster. You can't go wrong. ORDER YOUR HUSKY TODAY! YOUR MONEY CAN'T BUY A BETTER MOTOR.



WINGSPAN 69" WT. 2½ LBS. INCLUDING HUSKY MOTOR. FULL SIZE DRAWING. All Wing Ribs and Body Formers Cut to Shape and Notched—Rudder, Elevator and Wing Tips Cut to Shape—Parts for Cowl—FenCell Holder Parts—Switch—Plug & Jack—Bracket for Elevator—Strips Cut to Size—Landing Gear Shaped—M & M Wheels—Silk—Dope—Glue—Masking Tape—Celluloid Sheet—Nothing Else to Buy—Color Yellow and Red Trimming.

BUY TOMORROW'S MODEL TODAY

COMPLETE KIT Including Silk Covering.....$8.50 (Add 35c Postage)
Including Bamboo Paper Covering $7.50 (Add 35c Postage)

DOUGLAS MODEL AIRCRAFT CO. 1400 North 45th Street SEATTLE, WASH., U. S. A.

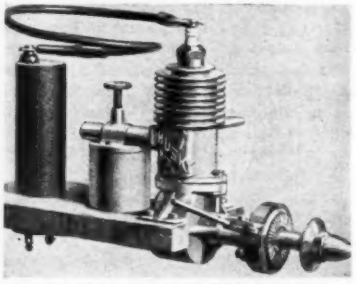
"DOUGLAS E-GULL" —GAS MODEL

UNPARALLELED Stability in Flight and Glide—Motor Safety Feature—High Performance Taper Wing—Shock Proof landing gear—Detachable elevator, rudder and wing. HONESTLY, you will say that it is Easiest and Strongest Model you ever built.

You need not worry about this model doing power dives, cartwheels, making unnecessary crashes, etc. The new design eliminates all these hazards—for a more stable and consistent flying model you better buy an E-Gull.

SEND FOR FREE CATALOG OF GAS AND RUBBER POWERED MODEL KITS AND SUPPLIES. DOUGLAS CONTEST MODELS FLY MILES AHEAD OF THE FIELD.

THE DOUGLAS MODEL AIRCRAFT CO. NOW OWN ONE-HALF INTEREST IN THE HUSKY MINIATURE MOTOR CO.



Dealers Write for Special HUSKY Discounts

Husky motor mounts, wt. ⅔ oz., per pr., postpaid 50c. Husky Non Brittle prop. 11" or 12" each, postpaid .....$1.00. Husky complete ready to run (less motor mounts, batteries and prop.) Postpaid.....$12.50

ORDER MOTORS FROM

HUSKY MINIATURE MOTOR CO.

1400 North 45th Street, SEATTLE, WASH., U. S. A.

of dark brown and green paint for camouflaging.

Draw the outline of the top view of the fuselage on the wood with the grain of the wood running lengthwise, and cut with jig-saw or sharp chisel. Then draw the side view in correct position and cut. Shape out the contour, as shown by the cross-sections, with a razor blade. Go over the surfaces with coarse and fine sandpaper until smoothness is obtained.

The other parts of the model are to be made in the same manner, using care and accuracy as the most important rule to follow. The neatness of workmanship also counts considerably in the building of a model.

The wing may be made in three parts, the two outer panels and the center section which will fit into a groove made in the belly of the fuselage later. The blades of the propeller may be shaped out and then cemented to the spinner with the correct pitch. Go over all parts with first coarse and then fine sandpaper, after they are whittled into shape.

The assembly is very simple. Lay the fuselage in flying position on a flat surface after cutting a groove to fit the center wing section. Cement the wing section in place and then the two outer panels with the desired dihedral. Put blocks under the wing tips to hold them in place. Join the tail pieces with plenty of cement to hold them firmly. When joints are thoroughly dried lay the model on its back and cement the radiator and landing gear in place. Using a straight pin as a shaft put the prop in the nose.

The wing fillets, the fairings that join the wing to fuselage, may be made of putty or plastic wood if you find them too hard to shape out of balsa wood. Go over the model once more with fine sandpaper and then begin the paint job, using the realistic camouflaging effect. Many coats will have to be applied before a smooth finish is obtained. After the last coat has dried your model will then be ready for exhibiting.

Building the Privateer

(*Continued from page* 13)

in plate 2. This will make the model fly to the right. The first flight should be made in the evening when there are no atmospheric currents. Such procedure will ascertain the attitude of the ship in flight. The plane is first tested by gliding, and when the flattest possible glide is attained then fly the ship under low power till a smooth right circle is obtained . Gradually increase the power, thus increasing the climb, always making sure that the spiral is not too tight. This arrangement will definitely produce consistent results under any flying condition.

Any questions should be addressed to the author, care of MODEL AIRPLANE NEWS.

Build and Fly the Triangle Sportster

(*Continued from page 7*)

found to be very efficient for a model of this size. The block is 3/4" x 1-1/4" x 6-1/4" blanked out as shown on the plan in the half-size sketch. Carve the blank slowly and carefully, undercambering the back about 1/8" at the widest section of the blade. Round off the tips and cut out the rear of the hub using the photos as a guide to shape.

A free-wheeling device adds greatly to the performance of any model through the reduction of the drag and upsetting force caused by a stationary propeller during the glide. Any type that works easily and efficiently may be used. A very practical type is illustrated on the plan. The upper end of the wire, passed through the 1/16" aluminum tube, is pressed against the face of the prop by the pressure of the bent-over portion of the prop shaft on the lower, or upright end. When the torque of the rubber is gone the shaft rotates the wire away from the face of the prop, allowing the propeller to spin freely during the glide.

Dope both the prop and nose block several times for strength and smoothness.

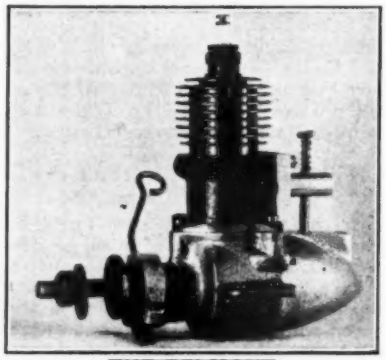
Covering and Assembly

Round off all sharp corners and edges with fine sandpaper. Cover the framework with either white or colored tissue, using dope for adhesive. Spray the surfaces lightly with water and apply a thin coat of dope, correcting any tendency to warp while drying.

Cement wing to the top of the fuselage and brace with streamlined struts of 1/16" sheet balsa. The stabilizer is attached at the proper negative incidence of 1/16", which will assure a difference of two degrees in incidence between wing and stabilizer.

Flying

Four strands of 3/32" flat brown rubber, preferably lubricated, are ample power for a .5 ounce model, though a greater amount may be needed for a heavier job. Before flying check the location of the center of gravity, adding enough clay inside the front or rear to balance model level at the C.G.



THE BELMONT

Bore ⅞" Stroke 15/16" H.P. 1½ Plus $9.95 Post Paid in U. S. Complete with Coil Condenser and Spark Plug

Exhaust Stacks $1.00 per pr.

These features found in no other motor at this price. Twin exhaust to each side of fuselage. Gas tank integral with crankcase. New port design assures easier starting, more economical operation. Cylinder and piston ground and lapped to .0002" tolerance. Guaranteed to hold compression as long as any motor on the market regardless of price. Cylinder cadmium plated. Extra large main bearing of Tobin bronze, crankcase practically indestructible. Every motor thoroughly run in and given wide open test before leaving factory. Satisfaction guaranteed.

Dealers write for information.

BELMONT MINIATURE MOTORS
64 Pleasant St., Watertown, Mass.

For the first flight wind the rubber about 100 times and hand-launch the ship in a suitable field free of obstructions. The model should fly in right circles and climb slowly. The rudder may be warped slightly to aid in turning in the desired direction. After testing under successively greater power, a machine winder can be hooked onto the eye of the prop shaft, the rubber stretched and wound to the capacity of 800 turns. Should the first burst of full power tend to fly the model in too small, banked circles without climbing, warp the leading edge of the right wing up about 1/8" to 1/4". (Looking at the plane from the front). With the construction and adjustment of the "Triangle Sportster" completed, many hours of true sport flying lie ahead.

Materials Needed

Sheet Balsa

1—1/32" x 2" x 18"
1—1/16" x 2" x 18"
1—1/8" x 2" x 2"

Strip Balsa

4—1/16" sq. x 18"
2—1/16" x 1/4" x 18"
1—1/8" sq. x 18"

Block Balsa

1—3/8" x 1" x 1-1/4"
1—3/4" x 1-1/4" x 6-1/4"

Miscellaneous

18" .028 piano wire
4 washers, 2 bushings
1 sheet tissue
1 oz. each of cement and dope
36" of 3/32" flat brown rubber
Scraps of tin or brass sheet.

The Passing of the Nationals

(Continued from page 21)

Moffett International Trophy and a MODEL AIRPLANE NEWS Plaque. All other winners in the event won MODEL AIRPLANE NEWS Plaques. In the order of their winnings, they were: Carl Stahl, Johnstown, Pennsylvania; Kenneth Lane; Leo Bailey; Arthur Beckington; Roy Smith, Toronto, Canada.

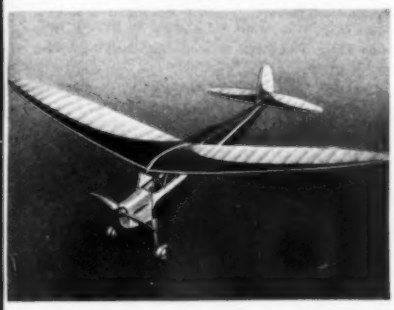
The flying scale model event brought out many ships of unique design. This event, in the open class, was won by Henry Struck of Jackson Heights, New York. He flew a flying scale model of a Caudron monoplane of about 1913 design (the ship, not Struck's model). This was a beautiful job and especially suited to this type model. Final results were:

Flying Scale Event

First place, senior division, went to Leo Bailey with 81 points. He won the Thomas Bourne Joy Memorial Trophy and Miniature, plus $19.52 as his share of the $100 awarded by William and Richard Joy in memory of their brother. John Ogilvie of New York City was second with 66 points to win a Cleveland gas kit, M & M gas wheels, $15.90 and a medal. Sydney Wallerstein of Boston placed third with 52 2/5 points to win $12.53. Roger Hammer of New York City won $11.33 by placing fourth with 47 2/5 points. Frank Merritt

NATIONAL CONTEST WINNER
AND WORLD'S FINEST
GAS MODEL, THE *Comet* "CLIPPER"

The sensation of the Nationals, won more places including 1st than all other kits combined. Flown and designed by Carl Goldberg, world's foremost model builder. Build a real winner that flies like a whiz—climbs over 600 ft. on 30 second motor run. Win contests and enjoy real gas model flying with this plane.



Model has wingspan of 6 ft. and weighs 2¼ lbs. with engine. Fits N.A.A. rules. Kit is complete with Timer to adjust motor run, has wheels, tapered spars, shaped leading edges, removable motor cowling, all paper and dope and a motor mount to fit any motor and many other features. The most complete kit on the market..... **$4.95**

WITH AIR WHEELS.....$6.50

GAS MOTORS SUITABLE FOR ABOVE MODEL

The following motors are stocked and Beshar approved:

Brown Jr. "D"	$10.00	Mighty Midget	$ 9.50
Dennymite Airflow	15.85	Gwin	12.00
Syncro Ace	13.75	Ohlsson	18.50
Brown Jr. "B"	21.50	Forster	17.75

CERTIFIED USED MOTORS
FOR SALE AT LOW PRICES

All guaranteed to be in perfect running order, all overhauled and worn parts replaced. Coils and Spark Plugs in good condition. Because we have the country's largest trade-in and repair dept. we can give these values. If there is any special used motor you want that is not listed, write us and we may have it.

Mighty Midget	$5.00	Brown "B"	$11.50
G.H.Q.	3.00	Brat (used 2 hrs.)	12.00
Baby Cyclone	6.00	Husky	6.00
Brown "C"	8.00	Ohlsson	8.00
Brown "D"	6.00	Trojan	10.00

Trade in Department
Trade in your old motor. We will give you the very best allowance, regardless of make or condition. Write for estimated allowance.

MOTOR REPAIR DEPARTMENT. For $1.00 we will take apart, overhaul, clean and readjust your motor. Replacing of worn or broken parts is done free, the only charge being for the replaced part. Try us. We are experts.

WE PAY CASH FOR USED MOTORS—Write for offer

BESHAR "PRECISION PROPS."
STILL THE WORLD'S FINEST PROPS

GAS MODEL PROPS

Give maximum efficiency. Specify model, all postpaid

10" dia. (8 or 10" pitch)	$ .75
13" dia. (8, 10 or 12" pitch)	1.25
14" dia. (8, 10 or 12" pitch)	1.25
15" dia. (8, 10 or 12" pitch)	1.50
16" dia. (8, 10 or 12" pitch)	1.50
18" dia. (12" pitch only)	1.75

1938 MODEL YEAR BOOK—BY ZAIC $1.00 P.P.

BALSA OUTDOOR PROPS

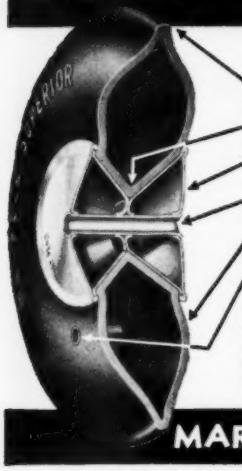
for Commercial, Scale or Stick Models. Finished, ready for use, with free-wheeling attachment.

12" dia.	$ .75
14" dia.	1.00
15" dia.	1.10
16" dia.	1.25

Comet Timers	$ .50
Austin Timers	1.25
Ignition Wire	.10
Coils	1.50
B.M. Gas Mixture, pint	.30
Self Starters, Cadet	3.00
Free Wheeling for Gas Props	2.50
Free Wheeling for Balsa Props	.15

BESHAR MODELS
NEW ADDRESS **329 EAST 54 ST., N.Y.C.**
"Premier Model Airplane Showrooms of America—1939 WORLD'S FAIR"

MARPELL WORLD'S FINEST STREAMLINED GAS MODEL WHEEL



No other wheel has all these patented features:

- **Raised "Wear-Ever" Tread.** Narrow ground contact prevents "ground-looping" . . . assures streamlined shape at full air pressure.
- **Full Diameter Pneumatic Cushion.** Fifty per cent more resiliency with shock absorption right to the very axle.
- **New Patented Duralumin Hub.** Fabricated all-metal hub, of conical shape, saves weight and can not rim cut. Polished to a bright chromium finish.
- **Long-Life Bronze Bearing.** Reduces friction . . . prevents wear and binding for entire life of wheel.
- **Finest Grade Ebony-Finished Rubber.** Smoothly vulcanized to an even .072" wall thickness . . . black satin finish not affected by heat or cold.
- **"Air-Check" Inflation Valve.** Holds full pressure indefinitely . . . valve is flush with tire . . . inflates with ordinary tire pump.

This new, no-leak, patented "Air-check" inflation valve is guaranteed against defect. Entirely original in design, this valve will not leak by outside manipulation or on landings. To regulate pressure, a simple adapter that fits any tire pump is furnished with each pair

Your choice, 4½" diam., wt. 4 oz. pr.; or 5½" diam., wt. 5 oz. pr., either size.

Per pair . . .

$2.00

Post paid in U.S. California Buyers add 6c State Sales Tax.

ORDER DIRECT FROM FACTORY

We have eliminated dealers' discounts and made possible this attractive price. Send postal money order. Please do not send checks.

MARPELL SUPERIOR PRODUCTS CO. 6406 Victoria Ave., Los Angeles, Calif.

of Detroit was fifth with 47 points to also win $11.33. James Cahill and Lawrence Rogge of Detroit tied for sixth place with 43 points. Each won $10.36. Ralph Brown of Arlington, Massachusetts, was seventh. He made 36 points to win $8.67. Henry Struck, with 65 points, won the open division and was awarded the William O'Neill Perpetual Trophy and a Baby Cyclone engine and propeller. William Gough, Jr., of Chicago was second with 56 3/5 points, to win the Fafnir Bearing Company Trophy.

Outdoor Stick Event

Robert Hoffmeyer of Akron, Ohio, won the Mulvihill Trophy, a 400 mile air trip on American Airlines and a Syncro Bee engine for placing first in the senior class with a flying time of 10 minutes, 24/25 seconds. Runners-up were Wallace Simmers of Chicago, Illinois, with a flight time of 9 minutes, 23 seconds, who was awarded the Comet Trophy; and Milton Huguelot of Chicago, who received a MODEL AIRPLANE NEWS Plaque for flying 6 minutes, 20 2/5 seconds. In the junior division Mike Gajdos of Akron, Ohio, placed first and won the Rayl's Hardware Trophy with a flight of 5 minutes, 19 seconds; followed by Carter Squire of Baltimore, Maryland, winning the Square D. Miller Trophy with a time of 3 minutes, 48 2/5 seconds; and Bob Romeisor, who flew 1 minute, 50 4/5 seconds to win a MODEL AIRPLANE NEWS Plaque. Conrad Renning of Minneapolis, Minnesota, placed first in the open division with a time of 5 minutes, 25 2/5 seconds and was awarded the New England Aircraft School Trophy. Alvin Gaskin of Atlantic City, New Jersey, won the Exchange Club of Detroit Trophy for second place with a time of 4 minutes, 43 seconds; and James Matulis of Chicago won a MODEL AIRPLANE NEWS Plaque for flying 4 minutes, 20 4/5 seconds.

On Friday the indoor builders held forth at Grosse Ile hanger, and the gas model fans at Wayne County airport.

Indoor Stick Event

Edward Domohowski of Boston, Massachusetts, took the lead in the junior division and was awarded the Link Trophy for a flight of 15 minutes, 8 1/5 seconds. Arthur Beckington of Rockford, ran second with a time of 12 minutes, 27 1/5 seconds to win a Syncro saw. Mike Gajdos of Akron won a MODEL AIRPLANE NEWS Plaque for his time of 9 minutes, 41 seconds. In the senior division we find Hewitt Philips of Belmont, Mass., ranked first to receive the indoor Stout Trophy, $25, and a trip on the Eastern Airlines from and to any point on the line. This award was given by Captain Eddie Rickenbacker. His time was 21 minutes, 53 4/5 seconds. Having flown 21 minutes, 6 seconds, Milton Huguelot of Chicago was second and won an M & M motor. Walter Loos of Philadelphia, Pennsylvania, placed third, with a time of 20 minutes, 35 1/5 seconds, and was presented with a Brown motor by Hobbycraft Model Supply Co. Charles Belsky of Chicago was a close runner-up with a time of 20 minutes, 31/5 seconds. He won a MODEL AIRPLANE NEWS Plaque. "Old Reliable" Carl Goldberg of Chicago won first place in the open division with a time of 19 minutes, 11 3/5 seconds to win the "Flying Aces" Trophy and the Springfield Perpetual Trophy. Thomas Harris of Toronto, Canada, won the Fleetwings Trophy for placing second with a flight of 18 minutes, 42 1/5 seconds; and Ed Fulmer of McKees Rock, Pennsylvania, won a MODEL AIRPLANE NEWS Plaque for flying 18 minutes, 14 seconds.

Indoor Cabin Event

Milton Huguelot won the senior division with a time of 13 minutes, 50 seconds, and was awarded the Bloomingdale Perpetual Trophy. Second place went to James B. Cahill of Indianapolis, Indiana, who was awarded a Falcon Camera, donated by D. Campbell, for flying 13 minutes, 2/5 seconds. John Stokes, Jr., of Huntington Valley, Pennsylvania, with a time of 12 minutes, 42 seconds, won a MODEL AIRPLANE NEWS Plaque. In the open division the winner was Henry Struck of Jackson Heights, New York, who was awarded the Fairchild Aircraft Corporation Trophy for a flight of 16 minutes, 1 second. Second place went to Bruno Marchi of Boston for a time of 12 minutes, 14/5 seconds to win an Argus Camera donated by the Acme Camera Company. James Matulis was third. He won a MODEL AIRPLANE NEWS Plaque for a flight of 12 minutes, 14/5 seconds.

The power model event was run over two days—Friday and Saturday. A certain number of contestants were assigned to fly on each one of these two days. The results were:

Gas Model Event

First in the open division was Milton Kahn of Philadelphia. His time was 23 minutes, 41 2/5 seconds to win the Gar Wood Perpetual Trophy and a $50 George S. Wheat award. Howard Carlson of Milwaukee, Wisconsin, was second with 14 minutes, 43 4/5 seconds, to be awarded the Berkeley Model Supplies Trophy and $20. Third place went to Richard Staab of Akron for a time of 6 minutes, 52 4/5 seconds. His awards were the Burgess Battery Trophy and $15. Joe Trefry of Glen Ellyn, Illinois, won the Reginald Denny Trophy for a flight of 4 minutes, 40 3/5 seconds; while Wilford Davis of Kansas City won the "Mechanix Illustrated" Trophy for flying 4 minutes, 30 seconds. Tome Laurie of Fort Wayne, Indiana, won a MODEL AIRPLANE NEWS Plaque for a time of 3 minutes, 44 4/5 seconds. Ed Manthey of Maywood, Illi-

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nois, with a time of 5 minutes, 50 seconds, won first place in the senior division. He received a George S. Wheat Memorial Trophy and $50. A George S. Wheat Memorial Trophy and $20 went to Bushman Deshick of Chicago, who was second with a time of 6 minutes, 25 2/5 seconds. Third place went to Robert Toft of Minneapolis, Minnesota, who received a George S. Wheat Memorial Trophy and $15 for flying 6 minutes, 10 2/5 seconds. Bob Apgar of Minneapolis was fourth with a time of 4 minutes, 23 seconds to win the Champion Spark Plug Trophy. Fifth place went to Billy McCraken of Greenville, Illinois, who won the Forster Brothers Trophy for flying 4 minutes, 10 3/5 seconds. Albon Cowles of Atlanta, Georgia, with a time of 3 minutes, 59 seconds, placed sixth and won a MODEL AIRPLANE NEWS Plaque.

It is impossible to adequately describe the scenes staged in the gas model event. If you can imagine twenty models taking off and in the air at once, with timers, starters and other spectators on the sidelines, you may have a fairly clear picture of the situation. All of this was staged with a background of the roaring motors of thirty or forty models, in the air or warming up. For all the world it was as if one had turned over a hive of bees. In fact, at one period the resulting effect was very similar of such action. Apparently all the model builders were ready to fly at once and planes were taking off, swooping and circling over the heads of contestants and timers with great ferocity. Those who wore hats, in many cases, either had to take them off or have them removed by the swooping planes. Many stiff necks resulted on the following day from an unsuccessful endeavor to look five ways at once. Several dog-fights among the models were noticed, or at least the maneuvers gave this illusion.

One of the most remarkable flights was made by a little six foot model which literally tore off the ground and spiralled itself vertically upward at an angle of about sixty to eighty degrees. Actually it acted as a helicopter, the propeller pulling it nearly vertical. It climbed to an elevation of about 600 feet before the motor cut. One could spend a week or two merely looking over the details of design and construction of the various planes that were entered. Therefore we will not attempt to go into this matter here. Instead we have found it necessary to present now only pictures of the winners and general activities. Next month a series of fine pictures of the models which took part in the contest will be shown, and the models described.

Toward the end of Saturday afternoon, after diligent work during the entire day, Walter Good had his radio-controlled model prepared for flight. He demonstrated the efficiency of the radio mechanism on the ground. It worked perfectly and great praise is due this young man for the unique and efficient mechanism which he employed. Paul Kreelick, his radio operator, shares this honor. The mechanism is one of the most complete and efficient that has been

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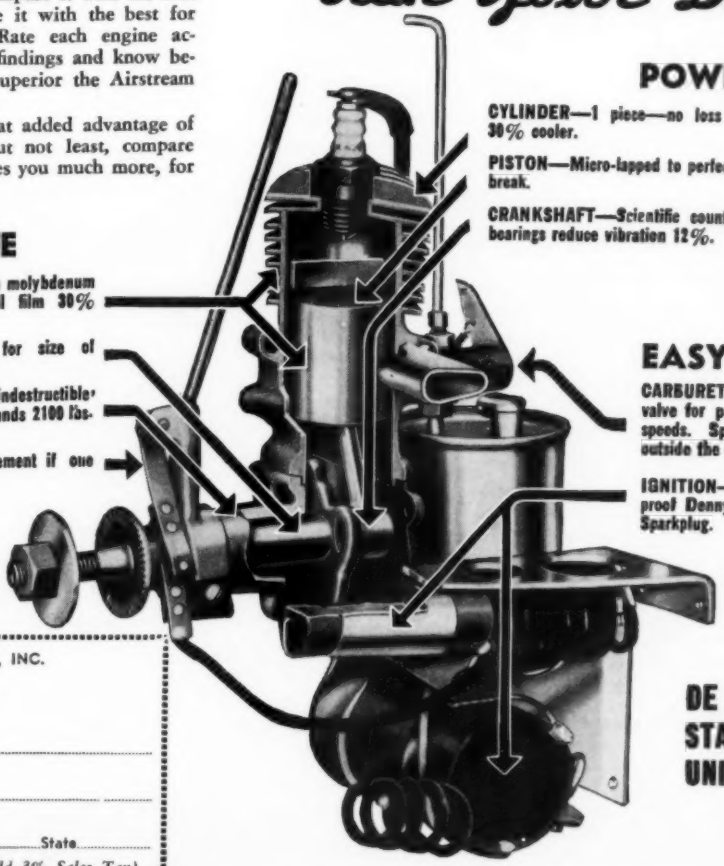

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3/16x3/16 ..... 8 for .25
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½ pint can... .35
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exhibited. Finally he undertook to fly his ship, even though the wind was blowing about twenty miles per hour and very gusty. It was difficult, because of the novelty of this type of ship, to keep the spectators from rushing the group who was endeavoring to prepare the model flight. However, finally the model was taken on the field. The motor started and it took off. Unfortunately the grass was quite long and some of it caught on the elevator flap and deflected the take off so that the model immediately went into a stall, from which it recovered. However a second stall after a zoom turned it over on its back and it made a complete loop. In the meantime, Walter was endeavoring to do a hundred yard dash back to the operating mechanism by means of which he hoped to remedy the disastrous conditions of flight. Unfortunately, though, at the bottom of the loop the model hit the ground just before it nosed up and before Walter could control the ship. The ship was not a complete washout, but the radio apparatus inside the ship looked as if someone had stirred it around in a concrete mixer. The tail and part of the mechanism was damaged and the nose was pushed in. In spite of this damage and the hours of work which had gone into the model Walter still had his smile, for which we commend him highly.

The model was a modified KG, powered with a Brown engine. It is quite remarkable that Good and Kreelick should have developed such an efficient and light radio equipment so that all that was required in the line of power was a Brown engine. The ship complete with radio weighed only 7½ pounds.

The twenty mile wind and the crack-up on the initial flight discouraged the other radio-control event entrants. Some of the other contestants were: Pat Sweeney of Chicago, Illinois, and Clinton B. DeSoto of Grandby, Connecticut. Mr. Sweeney's model was a Cavalier in which a very unique system was established and demonstrated on the ground. The most interesting model was Mr. DeSoto's. His ship had a wing spread of fifteen or sixteen feet and gave one the impression that if he stepped into the cockpit the plane would actually take him up. It was powered by a two cylinder opposed Forster Brothers engine, which developed more than one horsepower, and delivered a static thrust of about fifteen pounds. This ship weighed a little over the twenty-five pounds limit.

It was evident from the experiences of these men that at least three or four days should be spent on assembling and testing before any preparation for flight. One day's time proved to be insufficient. This was the prime cause of the lack of successful flights with radio models. The gusty weather clinched the matter, as far as flights were concerned. Final results were:

Radio Controlled Event

Walter Good of Kalamazoo, Michigan, won this event. He received the MODEL AIRPLANE NEWS Trophy, R. C. A. radio, Baby Cyclone engine donated by Major Moseley. Clinton DeSoto of Grandby, Connecticut, won a Detrola Airwave Radio by placing second. Howard Flanagan was third, to win a Seversky Trophy. Pat Sweeney of Chicago, by placing forth, won a wrist watch presented by Charles Berkey. Winner of fifth place, Michael Roll of Dearborn, Michigan, won an Ohlsson motor.

The most active club, the Junior NAA Chapter of Akron, Ohio, was presented with the Fred W. Megow Trophy. The runner-up for this trophy was the Chicago Aeronauts, NAA Chapter.

Mary Roll of Dearborn, Michigan, was awarded the Women's National Aeronautical Association of Detroit Trophy for being the most active girl in the contest.

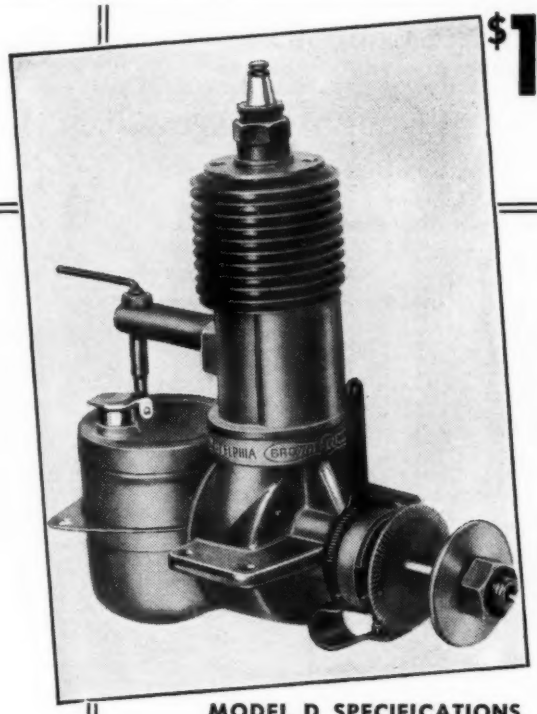
The Berryloid awards were won by Harold Coovert of Dayton, Ohio, for the best-finished gas model and Max Sokol of Hamtramck, Michigan, for the best flying scale finish.

In recognition of his pre-eminent service to model aviation, the Academy of Model Aeronautics presented Howell Eurich with an Honorary Fellowship. This was not only for his successfully carrying out the gigantic task of promoting the national meet, but also for his creating the interest and securing the backing of the National Exchange Club organization in the promotion of model aeronautics among the 800 clubs throughout the country. This recognition is the greatest honor model aviation can offer to any individual. The work of encouraging the Exchange Clubs throughout the nation to foster model building as a service to aviation and service to youth is now being carried out by National Exchange; and the result of this work should be a definite factor in the growth of model aeronautics in America within the next year. Said Roland Bixler of the National Exchange, "Interest of the National Exchange Clubs throughout the country in model aircraft will expand within the year, based on the splendid results of the 1938 meet."

The National Aeronautic Association presented medals for "Service to Aviation" to the working committee men of the Exchange Club of Detroit.

The Exchange Club of Detroit, Miller Tool and Manufacturing Company, Stinson Aviation Corporation, and Leonard Insurance Company medals, numbering 200 in all, were presented to the runners-up in each of the events.

During the period of the meet, conferences and discussion sessions lasted far into the night. In this respect, the contestants were concerned with design and construc-



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tion of ships; the officials with procedures of operating contests, rules and organization. The Nationals in this way, is an invaluable institution, for it is the one time that all the contestants and leaders in model activities get together.

The activities were climaxed by a banquet on Saturday night, which was held on board one of the lake steamers, the "Greater Buffalo." This was made possible through the generosity of the Plymouth division of the Chrysler Corporation. About 700 attended the dinner, after which they assembled in the salon of the ship where the awards were distributed.

The pictures of the events, which accompany this article, tell the story more vividly than words.

Appreciation on behalf of model builders and the industry is extended by MODEL AIRPLANE NEWS to the Exchange Club of Detroit, Mr. Eurich, Mr. Irwin and Nathan Polk, Mr. Level, Mr. Vhay, Mr. Jellison and the multitude of others who contributed to the success of the contest. The personnel of the Hotel Fort Shelby was extremely generous and courteous. And, of course without the donation of the flying field and hangar by the Wayne County airport officials the contest would not have been possible. And the "eats"! The box lunches, supplied throughout the meet, were generously donated by the Chevrolet Corporation; and the banquet, the "grand finale" to this highly successful event, was made possible by the Chrysler Corporation, Plymouth division. Transportation to and from the field was provided by the Ford Corporation.

Too much cannot be said to show the appreciation of everyone for the many grand prizes donated. To all the concerns, individuals and organizations who gave so freely, this highly appreciated factor to the success of any contest, our sincerest "Thank you." Words are insufficient to express our gratitude. All we can say is that we are sure your kindness will be returned to even a greater measure than it already has been by making so many people happy.

Special recognition should be given Mr. William Enyart, secretary of the National Aeronautic Association, who has worked diligently and long on the organization of model aeronautics in general and this contest in particular. It is he who has laid out the nation-wide plan under which model builders and fliers may prosper in an organized manner. This organization has now reached the stage where an efficient method of operation and the organized working of contests is being developed. Naturally during this period of growth final methods of operation have not been reached. We therefore request every model builder's personal interest in this contribution to all modellers and endeavor to build up the organization of the N.A.A. which will serve in an unselfish manner all those who participate in model work. It is only through untiring effort that this can be accomplished. Criticism is welcome, but let us make this *constructive* criticism rather than that of the destructive variety. Another year of effort on the part of everyone in the game should show a contest which is even larger and better in 1939.

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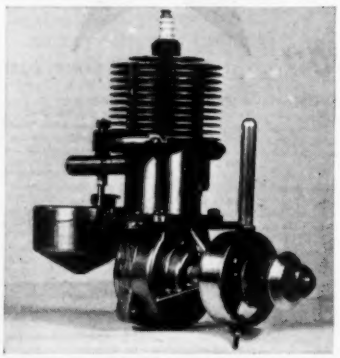

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Complete Contest Results

OUTDOOR CABIN EVENT—JUNIOR CLASS

Arthur Beckington, Rockford, Ill.	31:08	Stout Trophy, $25.00 and 400 Mile American Airlines Trip
Billy Riffel, Frontenac, Kans.	2:30	Hym & Kendall Trophy
Pasqualo Fuimano, Syracuse, N.Y.	2:14	MODEL AIRPLANE NEWS Plaque
George Singer, Detroit, Mich.	1:26.2/5	Suit and Medal
Edward Domohowski, Boston, Mass.	1:07.1/5	Pen Set and Medal
Donald Jockem, Syracuse, N.Y.	1:07.4/5	Medal
Mike Gajdos, Akron, Ohio	1:03.3/5	Medal
Nick Savant, Atlanta, Ga.	1:01.1/5	Medal

OUTDOOR CABIN EVENT—SENIOR CLASS

Leo Bailey, Akron, Ohio	23:35.4/5	Casey Jones Aero School Trophy
Kenneth Lane, Milwaukee, Wis.	23:29	Baker-Eberle Trophy
Morris Huff, Milwaukee, Wis.	19:24	MODEL AIRPLANE NEWS Plaque
Edgar Pickens, Rockford, Ill.	18:43	Suit and Medal
Milton Huguelet, Chicago, Ill.	16:16.3/5	Pen Set and Medal
Earl Stahl, Jamestown, Pa.	15:46.1/5	Scout Knife and Medal
John L. Ogilvie, New York, N.Y.	14:55.4/5	Scout Knife and Medal
Rodney Streed, Waukegan, Ill.	13:18	Medal
Roy Nelder, Toronto, Canada	10:35.3/5	Medal
Fred Bower, Toronto, Canada	10:06.3/5	Medal
Pete Stapilus, Rockford, Ill.	9:37.4/5	Medal
Bob Apgar, Minneapolis, Minn.	9:23.4/5	Medal
Henry Gieryn, Detroit, Mich.	9:06	Medal
Henry Naudzious, Detroit, Mich.	6:55	Medal
Ted Just, Johnstown, Pa.	6:06	Medal
James Cahill, Indianapolis, Ind.	5:25.3/5	Medal
Robert Dale, Detroit, Mich.	4:51.1/5	Medal

OUTDOOR CABIN EVENT—OPEN CLASS

Frank Zaic, New York, N.Y.	17:06.1/5	Switlik Parachute Co. Trophy
Lavelle Walters, Windsor, Canada	8:23	Ellman & Kinnie Trophy
Henry Thomas, Akron, Ohio	8:08	MODEL AIRPLANE NEWS Plaque
Henry Stiglmeier, Inglewood, Calif.	8:	Cleveland Model Gas Kit
Henry Struck, Jackson Hts., L.I., N.Y.	7:21.1/5	Pen Set and Medal
Robert Chatelain, Findlay, Ohio	6:17	Medal
Harry Soper, Rockford, Ill.	3:25.4/5	Medal
Ed Fulmer, McKees Rock, Pa.	3:25.4/5	Medal
Michael Roll, Dearborn, Mich.	2:57.4/5	Medal
Alvin Gaskill, Jr., Atlantic, N.Y.	2:21.3/5	Medal
Ray Smith, Toronto, Canada	2:03	Medal
Art W. Eck, Johnstown, Pa.	1:56	Medal
Ira J. Fraelick, Syracuse, N.Y.	1:52.2/5	Medal

OUTDOOR STICK EVENT—JUNIOR CLASS

Mike Gajdos, Akron, Ohio	5:19	Rayl's Hardware Trophy
Carter Squire, Chevychase, Md.	3:48.2/5	Square Deal Miller Trophy
Bob Romeiser, Indianapolis, Ind.	1:50.4/5	MODEL AIRPLANE NEWS Plaque
Edward Domohowski, Boston, Mass.	1:23	Scientific Miss Phila. Kit
Pasquale Fuimano, Syracuse, N.Y.	1:19.3/5	Pen Set and Medal
Nick Savant, Atlanta, Ga.	1:06	Medal
Kenneth Zeek, Milwaukee, Wis.	1:05	Medal
Donald Jockem, Syracuse, N.Y.	1:04	Medal
Edward Izzo, Syracuse, N.Y.	:54.2/5	Medal
Alfred Lipport, Aurora, Ill.	:51	Medal

OUTDOOR STICK EVENT—SENIOR CLASS

Robert Hoffmeyer, Jr., Akron, Ohio	10:24.2/5	Mulvihill Trophy, 400 Mile American Airlines Trip and Syncro Motor
Wallace Simmers, Chicago, Ill.	9:25	Comet Trophy
Milton Huguelet, Chicago, Ill.	6:30.2/5	MODEL AIRPLANE NEWS Plaque
Jack Swartz, Akron, Ohio	6:11	Bunch Boat Kit
Joseph V. Boyle, Jr., Corapolis, Pa.	6:04.2/5	Pen Set and Medal
Robert Dillman, Syracuse, N.Y.	6:03.4/5	Medal
Leo Bailey, Akron, Ohio	5:53.3/5	Medal
Edward Naudzious, Detroit, Mich.	5:48	Medal
Edward Pickens, Rockford, Ill.	5:30	Medal
Walter Skeele, Hamtramck, Mich.	5:22.3/5	Medal

OUTDOOR STICK EVENT—OPEN CLASS

Conrad Renning, Minneapolis, Minn.	5:26.2/5	New England Aviation School Trophy
Alvin Gaskill, Atlanta, Ga.	4:43	Exchange Club of Detroit Trophy
James Matulis, Chicago, Ill.	4:20.4/5	MODEL AIRPLANE NEWS Plaque
Henry Stiglmeier, Englewood, Calif.	4:07.4/5	M & M Air Wheels
James Noonan, Milwaukee, Wis.	3:30.3/5	Pen Set and Medal
Bernarr Anderson, Akron, Ohio	3:10.1/5	Medal
Mary Roll, Dearborn, Mich.	3:03.2/5	Medal
Arthur Eck, Johnstown, Pa.	2:30.2/5	Medal
Salem F. Barrack, Harrisburg, Pa.	2:30	Medal
R. H. Bodle, Akron, Ohio	2:25.1/5	Medal

INDOOR STICK EVENT—JUNIOR CLASS

Edward Domohowski, Boston, Mass.	15:08.1/5	Link Aviation Devices Trophy
Arthur Beckington, Rockford, Ill.	12:27.1/5	Syncro Saw
Mike Gajdos, Akron, Ohio	9:41	MODEL AIRPLANE NEWS Plaque
W. Newlin Hewson, Philadelphia, Pa.	8:16	M & M Air Wheels and Medal
Wilfred Bobier, Detroit, Mich.	6:19.1/5	Pen Set and Medal

INDOOR STICK EVENT—SENIOR CLASS

W. Hewitt Philips, Belmont, Ill.	21:53.4/5	Stout Trophy, Eastern Air Lines Trip and $25.00
Milton Huguelet, Chicago, Ill.	21:06	M & M Motor
Walter Lees, Philadelphia, Pa.	20:34.1/5	Hobby Craft Award of Brown Jr. Engine
Charles Belsky, Chicago, Ill.	20:03.1/5	MODEL AIRPLANE NEWS Plaque
Harry Dolfi, Chicago, Ill.	18:30	M & M Air Wheels and Knife
Ralph Brown, Arlington, Mass.	18:14.2/5	Pen Set and Medal
Leo Bailey, Akron, Ohio	18:05	Medal
John Strokes, Jr., Huntington Valley, Pa.	17:25	Medal
James Cahill, Indianapolis, Ind.	17:15	Medal
John Meyer, Elgin Mills, Ont.	17:07.1/5	Medal
Paul Plecan, Long Island City	16:52	Medal
Robert Jacobson, Philadelphia, Pa.	16:42	Medal
Gordon Cain, Boston, Mass.	16:12	Medal
Roger J. Hammer, New York City	15:27.3/5	Medal

INDOOR STICK EVENT—OPEN CLASS

Carl Goldberg, Chicago, Ill.	19:11.3/5	Flying Aces and Springfield Trophy
Thomas Hanis, Toronto, Ont., Can.	18:42.1/5	Fleetwing Trophy
Ed Fulmer, McKees Rock, Pa.	18:14	MODEL AIRPLANE NEWS Plaque
Alvin Gaskill, Jr., Atlantic City, N. J.	16:50.8	One Blade Prop and Medal
Bruno Marchi, Medford, Mass.	16:39.9	Pen Set and Medal
James P. Matulis, Chicago, Ill.	16:34.1/5	Medal
Mr. Jean S. Chadwick, Syracuse, N.Y.	15:12	Medal
Henry Struck, Jackson Hts., L.I.	15:06	Medal
Frank Haynes, New York, N.Y.	14:54.3/5	Medal
Curtis Janke, Sheboygan, Wis.	12:54	Medal

Mary Roll, Dearborn, Mich.	12:21.2/5	Medal
Richard Bodle, Akron, Ohio	11:30	Medal
William E. Gough, Jr., Chicago, Ill.	11:25.1/5	Medal
John Dilly, Galt, Ont., Can.	10:09	Medal
Michael Roll, Dearborn, Mich.	9:25.3/5	Medal

INDOOR CABIN EVENT—SENIOR CLASS

Milton Huguelet, Chicago, Ill.	13:50	Bloomingdale Trophy
James B. Cahill, Indianapolis, Ind.	13: .2/5	Falcon Camera, presented by D. Campbell
John Stokes, Jr., Huntington Valley, Pa.	12:42	MODEL AIRPLANE NEWS Plaque
Charles Belsky, Chicago, Ill.	12:35	One Blade Prop and Medal
Richard Obarski, Chicago, Ill.	12:33.4/5	Pen Set and Medal
Irving Kovenat, Chicago, Ill.	11:49.2/5	Medal
Dennis Turner, Chicago, Ill.	11:37.1/5	Medal
Sydney Wallerstein, Boston, Mass.	11:25.3/5	Medal
Edmund Swort, Chicago, Ill.	11:21	Medal
W. Hewitt Phillips, Belmont, Mass.	11:17.2/5	Medal
Edward Naudzious, Detroit, Mich.	11:03	Medal
Walter Erbach, Sheboygan, Wis.	9:53.2/5	Medal
Ted Just, Johnstown, Pa.	9:52	Medal
Bert Norman, Vancouver, B.C.	9:41	Medal
S. W. Stanwick, E. Cambridge, Mass.	9:33.3/5	Medal

INDOOR CABIN EVENT—OPEN CLASS

Henry Struck, Jackson Hts., L.I., N.Y.	16:01	Fairchild Aircraft Trophy
Bruno Marchi, Boston, Mass.	12:22.2	Argus Camera presented by Acme Camera Co.
James Matulis, Chicago, Ill.	12:01.8	MODEL AIRPLANE NEWS Plaque
Curtis Janke, Sheboygan, Wis.	11:15.2	Knife Set and Medal
Ed Fulmer, McKees Rock, Pa.	9:52.8	Knife Set and Medal
Henry Thomas, Jr., Akron, Ohio	8:46.8	Medal
Thomas Hanis, Toronto, Ont.	8.17.8	Medal
John Dilly, Galt, Ont., Can.	7:33.6	Medal
Ira Fralick, Syracuse, N.Y.	7:30	Medal
Alvin Gaskill, Jr., Atlantic City, N.J.	5:53	Medal
Salem Barrack, Harrisburg, Pa.	5:42	Medal
Dick Bodle, Akron, Ohio	5:03.5	Medal
Frank Haynes, New York City	2:30.6	Medal

FLYING SCALE EVENT—SENIOR CLASS

Leo Bailey, Akron, Ohio	19:52	T. B. Joy Memorial Trophy, M & M Air Wheels and Cash
John Ogilvie, New York City	15:9	Cleveland Model Kit, M & M Air Wheels and Cash
Sydney Wallerstein, Boston, Mass.	12:53	One Blade Prop, Medal and Cash
Roger Hammer, New York City	11:33	Knife Set, Medal and Cash
Frank Merritt, Detroit, Mich.	11:33	Medal and Cash
James Cahill, Indianapolis, Ind.	10:36	Medal and Cash
Lawrence Rogge, Detroit, Mich.	10:36	Medal and Cash
Ralph Brown, Arlington, Mass.	8:67	Medal and Cash

FLYING SCALE EVENT—OPEN CLASS

	Points	
Henry Struck, Jackson Hts., L.I., N.Y.	65	Wm. O'Neill Trophy & Baby Cyclone Engine
Wm. Gough, Jr., Chicago, Ill.	56.3/5	Fafnir Bearing Co. Trophy
Henry Thomas, Akron, Ohio	53.3/5	Knife Set and Medal
Max Sokol, Hamtramck, Mich.	48	Medal
James Noonan, Milwaukee, Wis.	44	Medal
Bruno Marchi, Boston, Mass.	41	Medal
Richard Thornton, Aurora, Ill.	39	Medal
Frank Franz, Detroit, Mich.	34	Medal

BEST FINISHED MODELS

(1) Frank Merritt
(2) Max Sokol
(3) W. E. Gough, Jr.

GAS POWER MODEL EVENT—JUNIOR CLASS

Ray Beaumont, Philadelphia, Pa.	1:28	Berkeley Trophy
Ed Manning, Jr., Detroit, Mich.	1:18	Romec Trophy
Bob Randolph, Kenmore, N.Y.	1:09	Exchange Club of Detroit Trophy
James Billingham, Kalamazoo, Mich.	1:04	MODEL AIRPLANE NEWS Plaque and Pen Set
Ralph Littler, Kalamazoo, Mich.	1	Pen Set and Medal
Bob Gilkyn, Detroit, Mich.	1	Pen Set and Medal

GAS POWER MODEL EVENT—SENIOR CLASS

Ed Manthy, Maywod, Ill.	6:50	G. S. Wheat Trophy, $50.00 and Baby Cyclone Engine
Bushan Deshick, Chicago, Ill.	6:25.2/5	G. S. Wheat Trophy, $20.00 and Baby Cyclone Engine
Robert Toft, Greenfield, Ind.	6:10.2/5	G. S. Wheat Trophy, $15.00 and Baby Cyclone Engine
Bob Apgar, Minneapolis, Minn.	4:23	Champion Spark Plug Co. Trophy
Billy McCrachen, Greenville, Ill.	4:10.3/5	Forster Bros. Trophy
Albon Cowles, Atlanta, Ga.	3:59	MODEL AIRPLANE NEWS Plaque
Carl Holzinger, Chicago, Ill.	3:45	Knife Set and Medal

GAS POWER MODEL EVENT—OPEN CLASS

Milton Kahn, Philadelphia, Pa.	23:41.2/5	Gar Wood Trophy and $50.00 Wheat Award
Howard Carlson, Milwaukee, Wis.	14:43.4/5	Berkeley Trophy and $20.00
Richard Staab, Akron, Ohio	6:52.4/5	Burgess Battery Co. Trophy
Joe Trefry, Glen Ellyn, Ill.	4:40.3/5	Reginald Denny Ind. Trophy
Winford Davis, Kansas City, Mo.	4:40.4/5	Mechanix Illust. Trophy
Tom Laurie, Ft: Wayne, Ind.	3:44.4/5	MODEL AIRPLANE NEWS Plaque
Henry Spates, Baltimore, Md.	3:41	Knife Set and Medal

RADIO CONTROLLED EVENT

Walter Good, Kalamazoo, Mich.	MODEL AIRPLANE NEWS Trophy, R.C.A. Radio and Baby Cyclone Engine
Clinton DeSoto, Granby, Conn.	Detrola Allwave Radio
Howard Flanigan	Seversky Trophy
Pat Sweeney, Chicago, Ill.	Wrist Watch presented by Chas. Berkey
Michael Roll, Dearborn, Mich.	Ohlsson Motor

WAKEFIELD TEAM (Represents America in France)

James Cahill, Indianapolis, Ind	MODEL AIRPLANE NEWS Plaque
James Bohash, Jr., Detroit, Mich	MODEL AIRPLANE NEWS Plaque
George DeLaMater, Oneonta, N.Y.	MODEL AIRPLANE NEWS Plaque
G. J. Wisniewski, Milwaukee, Wis.	MODEL AIRPLANE NEWS Plaque
Henry Stiglmeier, Inglewood, Calif.	MODEL AIRPLANE NEWS Plaque
William Pfeil, San Antonio, Texas	MODEL AIRPLANE NEWS Plaque

MOFFETT INTERNATIONAL CONTEST

Roy Nelder, Toronto, Canada	MODEL AIRPLANE NEWS Plaque
Carl Stahl, Johnstown, Pa.	MODEL AIRPLANE NEWS Plaque
Kenneth Lane, Milwaukee, Wis.	MODEL AIRPLANE NEWS Plaque
Leo Bailey, Akron, Ohio	MODEL AIRPLANE NEWS Plaque
Arthur Beckington, Rockford, Ill.	MODEL AIRPLANE NEWS Plaque
Roy Smith, Toronto, Canada	MODEL AIRPLANE NEWS Plaque

With a Tom Thumb motor to power this new ship through the test flights, Bud Warren gets a real thrill as he gives the front propeller nut the final cinch.

BUD WARREN Says:

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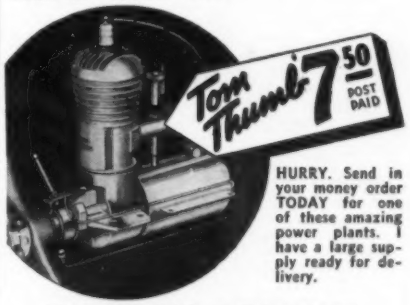
You can also purchase direct by mail order a brand-new Tom Thumb engine for $7.50. Assembled and block-tested. I guarantee each engine full 1/5 h.p. Complete with fuel tank, coil, spark plug, one-piece cylinder and head and other modern features. Flying weight (less batteries) 10 oz."



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Send me $5.50 and your old type Mighty-Midget or Gwin-Aero and receive an engine completely rebuilt to new specifications, with all the latest improvements. This exchange service includes complete rebuilt cylinder, new rings, spark plug, band point and insulation, spring points, condenser and gaskets.

The following are replaced with new parts, or rebuilt where needed: main bearing, crankshaft, crankcase, piston, con rod and wrist pin. Tank and carburetor rebuilt or new. Also new coil where needed.

Block-tested and set in first-class running condition, these engines are packed and shipped immediately. You must send in all engine parts, including tank and coil, regardless of condition, or include the factory list price of missing parts.

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☐ Rush me 1 new Tom Thumb Engine, I enclose $7.50.
☐ I am sending my old BUNCH engine and $5.50. Send me a rebuilt motor of the same type.
☐ I am sending my old motor and $6.50. Send me a "Mighty-Midget" rebuilt to new specifications.

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Giant FLYING MODELS

complete in every detail

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No. 701 ART CHESTER RACER

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185—CONSOLIDATED P-30	195—AERONCA C3
186—FAIRCHILD WARNER 22	196—DE WOITINE

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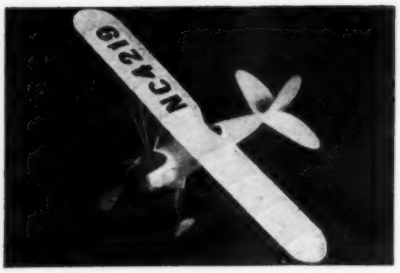

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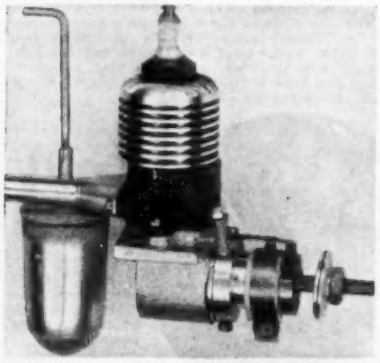

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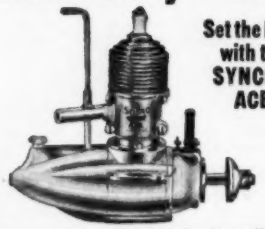

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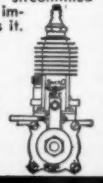

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The Physics of the Airplane

(Continued from page 15)

lubricating agent. This means that its ability to retain its viscosity is retained. And this is one of the ways of judging the operating characteristics of lubricants. Liquids which do not have high viscosity usually have a low initial surface tension. Such liquids are water and ethylene glycol which are used as cooling agents for airplane motors of the indirectly cooled type. These liquids boil at a comparatively low temperature when compared to other more viscuous liquids, although they possess the capacity to absorb heat. Hence low viscosity liquids are used mainly as cooling agents in airplane work. In general, it may even be said that the air and the sea are viscuous to the flight of an airplane or the taxying of a seaplane.

The system of units which is employed in the United States is based upon the English system. In this system of units, length, time, mass and speed are specifically defined for standards of measurement. Overseas the metric system is extensively used for all forms of airplane construction work and design. As a rough comparison the two systems line up thus: The inch and centimeter are comparable units. The yard and the meter are used in a similar capacity but a large variation occurs when we consider the measurement of distance, and this is important when performance is to be considered. The kilometer of the metric system is 5/8 of the mile. Thus when reading about the performance of overseas aircraft be sure and determine what system of distance measurement is used or else your results will be misleading.

In airplane construction work, the designation of all parts, as to length, is usually made in inches. Thus a wing which has a span of 30 feet is represented on the drawing to be 360 inches. Fractions of an inch are further sub-divided into hundredths of an inch. Now this perhaps seems complicated, but then it is an established system. Time and time again efforts have failed to move the Congress of the United States to pass legislation to correct this inefficient method of measuring. The opposition has been omnipotent in this respect, basing their contention on the enormous cost involved to make a national change in our manufacturing standards. At the present time, manufacturers of small airplane components, such as bearings, manufacture two sizes, one size in inches and the other in meter fractional parts. The gauges of metals of the U. S. Standard Gauge are based on a ratio which is determined by the manufacturers of flat sheets. This gauge is given in hundredths of an inch and is so designated on all airplane production drawings and on all drawings for equipment for the U. S. Government.

The units of mass are based on the pound and ounce in the English System and the kilogram and gram in the Metric System. The Metric System is used overseas in all cases. The units of time are uniform throughout the world. The smallest part of time measurement is the second which is 1/84,600 part of the mean solar day. Airplane performance measurements in the United States are based in miles per hour or feet per second, while overseas this is equivalent to kilometers per hour or centimeters per second. The units of volume are based in airplane work in the United States and England on the gallon. This refers chiefly to fuel capacity. In Europe the liter is used which is defined as equal to one kilogram of water at maximum density.

This brings us to the point where the subject of density may be discussed. The term density is equal to the mass per unit volume. Densities in the English System are expressed in so many pounds per cubic foot. If the Metric System is used to measure the same quantity, the expression must be in grams per cubic centimeter. As an example in this respect, the following will serve to illustrate the point under discussion:

A quantity of high octane gasoline has a mass of 100 pounds. The volume is equivalent to 16 gallons. Find the density of the fuel. The equation to be used is:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume of a body}}$$

$$\text{Density} = \frac{100 \text{ pounds}}{16 \text{ gallons}} = 6.25$$

Density = 6.25 pounds per gallon.

As an example of this: In the determination of the flight range of an airplane, it is convenient to figure the number of pounds of fuel the machine will consume to fly a specific distance in still air. Then the number of gallons that is necessary to guarantee this performance may be readily determined. Radial engines consume .55 pounds of fuel per horsepower per hour. For a practical example determine the number of gallons of high octane gasoline consumed during the course of a four hour flight by a Wright Whirlwind radial engine developing 225 H.P. Solution:

$$225 \times 0.55 \times 4 = 495 \text{ pounds of fuel used}$$

$$\frac{495\#}{6.25\# \text{ per Gal.}} = 79.2 \text{ Gal. of fuel used.}$$

When the term "quantity" is used, it should be defined what kind of quantity is meant. It is customary to divide quantities into two general classes, vector quantities and scalar quantities. Mass is a scalar quantity. The volume, area or time of an object are scalar quantities. Vector quantities have directional qualities as well as definite magnitude. The direction and magnitude are essential in describing a vector quantity. The displacing of some particular body is a vector quantity. Speed is a vector quantity when it is properly defined at many miles per hour, the direction such as north or south, etc., and in the case of an airplane, at the particular altitude that the airplane was flying. Likewise forces can be defined as vector quantities because they possess both magnitude and direction.

The science of graphic statics is a study of the phenomena of the vector quantities and the resultants of two or more forces. The total effort which replaces two or more forces is known as a resultant of those forces. In graphical analysis of forces, the investigation of a number of forces which correspond to some definite vector quantity is spoken of as "a resolution of the forces." Single vectors may be added together. The resultant in this case is the total of the values of all of the forces. Where two forces act at an angle of 90 degrees to each other and are equivalent to each other in magnitude, the resultant will act at an angle of 45 degrees to the two original forces. See Figure 2. This shows the graphical method of depicting vector quantities and the application to the forces acting on an airfoil. It may be stated here that vectors are not mathematical quantities that act in accordance with the conventional arithmetical laws but must be investigated on a geometrical basis.

In dealing with vectors, certain arithmetical values may be assigned to each vector and the quantity laid off to some definite scale. Thus the resultant can be determined by the method of parallelogram of forces and scaled directly, which establishes its value. Perhaps no branch of mechanics employs the use of vectors more so than the graphical analysis of aircraft structures. This is the simplest method of stress analysis although it must be substantiated and proved by the algebraic method for analyses which are submitted to the Bureau of Air Commerce with a view to obtaining an A. T. C.

Definitions of Words
Article 2

The Laws of Motion of an Airplane

Gaseous: In the form or nature of a gas.

Liquid: A substance in the liquid state.

Organic: Pertaining to materials derived from living organisms.

Inorganic: Pertaining to materials derived from the earth.

Carburetted: To mix gasoline and air together in a carburetor.

Compression: The act of compressing a gas in an internal combustion engine.

Expansion: To increase in volume.

Superaspiration: To supercharge an internal combustion engine.

Viscuous: Possessing the characteristics of viscosity.

Viscosity: The property of a liquid that when flow occurs inside of the mass of liquid, forces arise in such a manner and direction as to oppose the flow.

Ethylene Glycol: A chemical liquid which is used as a cooling agent in liquid cooled motors. It is derived from ethylene compounds.

Metric System: A decimal system of measures and weights which have the meter and the gram as the bases.

Vector: A straight line indicating the direction by an arrowhead and the magnitude of velocities by its length.

A. T. C.: This is an abbreviation of Approved Type Certificate. This is granted by the U. S. Bureau of Air Commerce when aircraft meet the structural and performance requirements of the Federal Government.

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$17.50

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MOTOR DIVISION
1180-25th Ave. Oakland, California

Plotting Ribs for Tapered Wings

(Continued from page 36)

the long side vertically. Run a vertical pencil line through the center. Thus if the paper is 9" x 14" it will be divided into two halves each 4-1/2" x 14". Pencil, it is to be noted here, is used all the way through. Use one no softer than 3H. About an inch below the top draw a line across the paper. Now get the measurement of the entire chord at the wing root. Draw this on the horizontal line just made, laying off one-half on either side of the vertical guide line. This is now the chord line of the root airfoil section with the vertical line at the fifty per cent point. Now, excluding the root section, count the number of remaining ribs included in that

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portion of the wing half where the leading and trailing edges are straight. That is, where the wing curves into the tip, any ribs in the latter section are not to be counted as they must be plotted separately. In other words if a wing is completely elliptical, this process will not hold good at all.

After these ribs have been counted, (note that there are nine such other ribs on the wing in the diagram) lay off on the vertical line, starting at the root base line and working down, as many equal distances as there are ribs. One inch distances will be just about right, here. This distance will provide enough clearance between the ribs when plotted. Through each point on the vertical line draw a horizontal line, roughly longer than the particular rib to be plotted on it. (For the wing in the diagram there would be nine more horizontal lines one inch apart). In describing this process it is understood that all these ribs are equal distances apart. Now find the chord of the wing at the location of the rib *last* counted, and lay this chord off on the bottom line drawn so that the vertical line will bisect it (same as root rib). This would be rib No. 10 on the drawing. Now divide the chord of this last rib and the chord of the root rib into ten equal parts.

This is done by following the diagram which explains this very clearly. The further subdivisions will depend on the particular airfoil to be plotted, which should already have been decided. Follow this graph of the airfoil when laying out the graphs of the two aforementioned ribs. Number each point of each rib such as 0, 1.25, 2.5, 5.0, 7.5, 10, 15, 20, etc., whatever they happen to be. Now with a ruling edge, connect each pair of corresponding points, and starting from the left, draw short dashes 1/8" or 1/4" wherever the edge intersects an intermediate horizontal line. When all dashes have been drawn on each line from leading to trailing edge it will be found that all these lines have been laid off and subdivided in perfect proportion to the actual ribs.

So by just laying out the two extreme chord lines, all the rest of the chord lines have been laid out automatically saving much time. Now boundary lines must be drawn around each chord line. That is, if the chosen distance between the chord lines was one inch. Then 11/16" above each chord line, draw a horizontal guide line as long as the chord, and 1/4" below each chord line draw another line as long as the chord. There should now be a clearance of 1/16" between the graphs-to-be of each rib. Using the T-square and triangle, run a vertical line through each little intersection in each chord line up to the top boundary line, and down to the bottom boundary line. The paper should now look like the figure in the left-center of the diagram. Since the tip rib of the wing is spaced the same as the other ribs, draw a new horizontal line below the last chord line drawn. Lay off the correct spar positions and thicknesses on the root chord line, and on the last regular rib (same as before).

After this connect the corresponding points making the dashes at the intersections on each chord line; only this time include the tip rib. Now draw the vertical lines, running about half-way between the base line and the boundary lines. Using these as guides, construct the extremities of the tip rib around these reference lines. Divide the tip chord line into the required number of divisions, just as all the regular ribs. Now the whole graph has been laid out in a comparatively short time, and with the maximum accuracy. It is a good idea at this time to number each graph with the number of the rib to be plotted on it. This should be put on the left side of each chord line, and on the right side put the length of the chord line to the nearest hundredth of an inch. This is done by using an engineers' scale which has tenths and twentieths of an inch divisions.

At this point the slide rule comes into use—the instrument which is THE time-saver and more than accurate enough for this purpose. The operation is very simple. Set which ever index will keep most of the slide in the groove to the length of the chord of the particular rib plotted. The index of course is the No. 1 found at each end on the C scale and is set to the chord length on the D scale. Now the table of ordinates of the airfoil must be followed. The indicator of the rule is slid to the per cent reading on the C scale while right under it on the D scale will be found the answer in decimal parts of an inch. The decimal point itself must be placed on inspection. For rubber models the reading will usually go no higher than tenths of an inch. A very high reading for the leading and trailing extremities of an airfoil will indicate hundredths of an inch. After the reading is obtained the distance is laid off from the chord line on which ever station it happens to be. Only the engineers' scale can be used for this. A ruler

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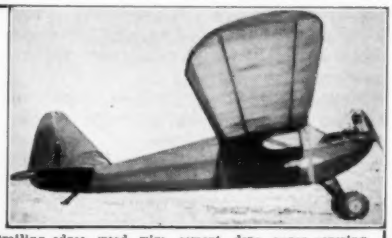

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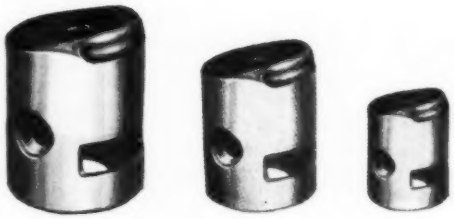

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is absolutely useless here. For any one rib, the slide is left set while the indicator is moved around to the various per cent values under which will be found the answers. But when the chord changes the slide must be reset again. When all the points are obtained, they are connected with French drafting curves.

When all the ribs are plotted, to transfer them onto the sheet balsa, a pricker or a sharp hat needle is used. It is easy to see through the paper. The needle is stuck through the points made in the plotting process. Each rib of course plotted twice. When the paper is removed, the points are again connected with French curves, and the ribs may then be cut out with a sharp razor.

Constant reference to the illustrations should make this scientific process a most simple, and fun-to-do job.

Why Not Tailless Models?

(Continued from page 11)

successful design, and it distinguished itself by really good gliding and soaring abilities.

Till now, strictly speaking, only gliders were built as tailless and it was for the first time at the national competition at Borkenberge 1935 that a really flying motor-model was introduced. On this model the motor lay cross-wise in the wings, as the skein would have had only very few turns because of the too short fuselage. The installation in the wings will probably be the only useful solution for a tailless model, and I advise the use of a tubular spar, which is light enough and sufficiently torsionally stiff that the wing cannot be deformed by the strain of the skein. Of course it is possible to use two motors turning in opposite direction on each side of the wing, so that the torque of them will probably compensate one another. The duration of this crate, which was built by Mr. Klose, Dresden, was about 30 scs., which is not too disappointing for an experimental ship. Special novelties were not incorporated in this model except the supplementary wing behind the main plane, which should increase longitudinal stability. It consisted of two wings one upon another. The upper was adjusted with a positive, the lower one with negative angle of incidence. The fast blowing wind, that lasted during the whole competition, did not allow exhaustive flights, so that I cannot give you a precise summary of the possibilities of the model.

The trend towards something better again and again produces new and different ideas in the brains of the model builders and so a new tailless appeared at the model glider competition in 1936. This model would have caught your eyes at once because of its new forms. The model, constructed by Mr. Armes, had an unusually low aspect ratio that diminished the strain of bending the spars at the root of the wing to a high extent, so that rather low and light spars could be employed and these again made possible the use of a very slim profile with low drag, and a low wing loading too. The constructor believed in being able to diminish the disadvantage of induced drag, which is especially great at those low aspect ratios—as is well known—to a high degree, by an elliptical shape of the leading edge. Besides he has the opinion, that a compensation of pressure can only be possible at the uttermost ends of the wings (because of the stream of air when flying) and in order to diminish it here too, he has attached two endplates at the tips. But unfortunately the model was superstable in lateral direction in consequence of the too low position of the c.g.; therefore it could not show its full performance. The ship has, in spite of the low wing loading, very high speed and a fairly flat gliding angle, which is chiefly due to the streamline shape of the whole model and to the thin airfoil. Some datas, that might interest: weight 1.100 grams, span 1.350 mm., full length 900 mm., utmost wing depth 750 mm.

Also in the last year a pretty surprise was starred. It was Adenaw again who attained with a fine trick, what others wished to do for years. In retaining the usual forms of wing he tried to make his model stable in longitudinal direction by a new regulation of the profile without the greatly used aid of washing out the wing. The profile of his flying plank was a normal one, that is to say, with an unfixed centre of pressure. It had a straight underside and a camber of about 1:10. All his trick, that now seems to us extremely simple consisted in turning this normal profile in the trapezoid dihedraled outer panels, so that the convex upper side now came to the underside. He hereby

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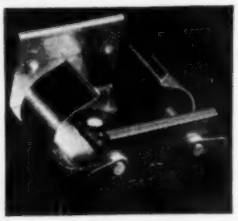

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obtained longitudinal stability, that was sufficient in any respect, without spoiling the gliding angle, which might be expected as the outer parts of the wing work "upside-down" in flight. The model had a span of 1.800 mm. and a wing loading of about 45 gr/dm². The ribs were built as flat ribs, that is characteristic for Adenaw. So far as I know there is an expert for this method of rib construction in U.S.A.: Roger Hammer, who has recently published the plans for his scale model of the Ross-Stephens soarer, employed a similar technique of rib construction. (See Frank Zaic: Model Aeronautics Yearbook 1937, fol. 69).

At the last national competition at Borkenberge, 1937, Adenaw showed also a tailless gas model which was distinguished by good longitudinal stability. Probably it concerns the development of a soarer of which I shall tell you now.

Some years ago a German sculptor, Antes, published sensational ideas of the future flying machine: namely a tailless. His ship consisted of four parts: the nose part, two side panels and the rear part which had an elevator at its center. The first impression of the machine is that there flies a low aspect ratio wing with a hole in the middle. At his time Antes had, so far as I know, very good success with this ship, but a realization of his ideas in a full size aircraft did not follow till now. Adenaw tried to build a model according to this project of Antes. In order to get a splendid finish he chose the monocoque method of construction, with very thin plywood as material, but soon it proved too heavy: the model had too high a wing loading and speed. Therefore Adenaw thoroughly constructed the model anew in employing again his flat ribs and balsa as material. The whole wing was divided into four sections, which were built in special jigs to insure an exact and easy job. The wing possesses two keeled-forward rudders which lie between the two lateral panels and the backside wing, which acts as an elevator. The problem of stability was solved without objection; longitudinal stability was attained by the difference of the angle of incidence between the front and outer panels mainly. Due to the fine design the gliding angle of the model, that flew with a speed of between 5-8 mtr./sc., was extremely good.

Hitherto I have left out an important item, which I wished to spare for the end of this first part: namely the so-called "Leipziger Flügel" (Leipzig-wing), because the model builders of that town brought it out for the first time. The wing has considerable dihedral, while the tips are bent down as negative "ears." Because of the strong dihedral of the middle part of the wing the C.P. lies very high above the central section, which is maintained by a light construction of the tips, so that lateral staggering by gusts is quickly suppressed. This wing, which was constructed according to the principles of elliptical distribution of lift, has shown extraordinarily good gliding angles, and as the directional stability is likewise good we often employ it for pusher and tandem models.

When you have read these lines and thought over the different structures and experiments to procure sufficient stability you will soon perceive what is important for a tailless. I will repeat a short summary. Directional stability by arrow form of the wing, as well as rudders. Triangular form and dihedral and a deep position of the C.G. for lateral stability. Lateral stability can be improved by placing the rudders upon the wing. Longitudinal stability is attained by arrow or triangular form, wash-out, and a suited airfoil. Concerning the triangular form of the wing: it does not matter whether you choose a triangular shape with a straight trailing edge or the arrow form itself. When you take arrow form dihedral and perhaps upwards bent ears, you will get a superstable model, that flies like a withered leaf, tumbling from one side to the other; therefore avoid being too much on the "safe side."

One of the most important points for the construction of a tailless is the exact determination of the C.G. and therefore I will quote some—perhaps already known—methods for it. The C.G. is easily found on a flying plank, it lies nearly at 1/4 of the profile depth from the l.e. or a little before that point, if you have chosen a profile with fixed centre of pressure.

If the ground plan of the wing is a trapezoid you must first draw the lines of the centre of pressure of both wings and also the longitudinal axis. Then the tips of the outer panels are separated, as they have no lift because of turbulence. Then divide both wing parts in two of the same area. The division meets the C.P. lines of both panels in the cutting point G. The line between these two points "G" cuts the longitudinal axis in "S" which represents the C.G.

The test flights of a tailless bring much excitement for the beginner, as the crate answers to many a mistake in construction, etc. with a reaction that is quite different from that of a normal model as we shall see. The first start should preferably be a running start. Seize the model in the C.G. and hold it in gliding position. On running you will perceive that the model becomes lighter and lighter in your hand and when it has nearly no weight you must let it go. If at once

after the start the model stalls and then dives in the tail is of course too heavy, and the nose must be trimmed with some weight. When the contrary is the case, i.e. the model takes a steep glide or even dives, then the nose is too heavy and you should gradually unburden the nose till the glide is satisfying. The distance of glide of tailless ships is scarcely better than that of normal models, because the used profiles with fixed centre of pressure do seldom get the same degrees of lift as normal profiles. This fact is not yet known to all model builders, who therefore try to improve the gliding angle by changing the position of the C.G. By this measure they obtain of course a lowering of the gliding speed but no or only an insignificant improvement of the gliding angle. But at the same time they get, by enlarging the angle of incidence, less longitudinal stability, which will show up especially on flights in ridge currents during the start.

The already mentioned Leipzig-wing, that has the German high-start record with a distance of 10.400 meters and a duration of 11 min., has been published as a commercial plan and it is often built because of its unusually good flying and stability qualities. When you start such a model it may happen that it stalls shortly after the start and dives though it is not tail heavy. Now the beginner will try to compensate this apparent overweight at the rear by adding much weight to the nose. Perhaps he succeeds in forcing the model to some sort of a "glide" but it will never attain a good performance by such measures, until he does remove the real mistake. In this case it is mostly insufficient wash-out, which is then to be increased to flatten out the trouble.

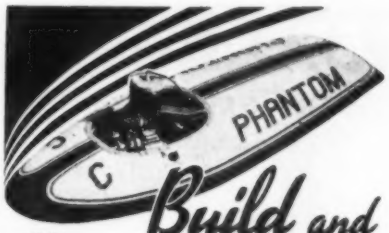
When the model curves after the start always to one side, suppose to the left side, you must examine whether the left wing has a larger angle of incidence than the right one. This is namely one of the curious qualities of the tailless, where it shows quite other reactions than a normal model with tail assembly. The tailless model lacks the suppression around the high-axis, which the normal model obtains by rudders and the side area of the fuselage, so that the increase of lift and resistance caused by the enlarging of the angle of incidence appears only with regard to drag, and that is why the model in this case curves to the left: the left wing now has increased drag. When you start a model from a steep slope, which made its test flights on a plain, where the wind is blowing across, it has for a short distance a greater angle of climb and speed of lift. This wind causes, like gusts, an enlargening of the angle of incidence, which can become so great that the largest angle of incidence legal for a nearly fixed position of the centre of pressure is surpassed, so that the model will stall and dive. This unpleasant behaviour can only be removed by adding weight to the nose, for then the gust has no more influence on the longitudinal stability in the way mentioned above.

Choose only quite calm weather for both the simple test flight with running start and for the first high start, as the qualities of start and flight cannot be judged in gusts. The starting hook is fixed at the underside of the fuselage at the point, the connection of which with the C.G. forms an angle of 60 degrees with the longitudinal axis of the model, or a little before that point.

When a model makes its test flights on a level, you can get good flights, hand launched, with a model that is only apparently longitudinally stable. But if you try to start such a model from a slope you will observe the flying manoeuvers I mentioned above (stall and dive). In such a case the nose is practically charged with supplementary weight. Then you will—I am quite sure—never see any more loopings, etc.

When a model is tail heavy it will surely complete a perfect loop when high-started, for then the C.G. lies behind the C.P., and as the C.G. is at the same time also the centre of motion, the steep position of the model becomes still steeper, the ring of the starting hook slips out of the hook and the model turns over.

The first high-start of your tailless ought to be made with a long and wholly stretched-out rope, though this may perhaps appear paradoxical at the first glance. Always when the model is completely and incontestably stable, the start, too, will be o.k. after some attempts of the starters. A model which has too much lateral stability, which can be removed only by a corresponding new construction, flies—as we call it in Germany—like a "withered leaf." In spite of this fault, scarcely per-



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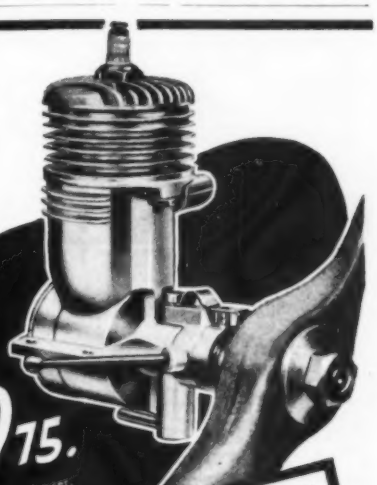

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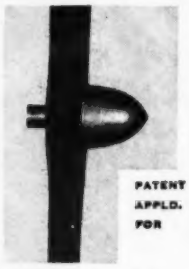

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ceived on hand-launched flights, the model can be successfully high-started with sufficient caution and with a very long and well-stretched rope. It is true, start and flight of such a model do not look very calming, but no matter you may be satisfied. If you take, instead of the necessary long and well-stretched rope, only a shorter and slightly stretched one, then the starting speed will be comparatively little and the possibility that the wing strikes the bottom at its first "swing" is nearly 100% and crashes often result too. Against this the strong impulse of a long rope takes care that the model gains a certain height so the assistant, who holds the rope, can release it as soon as the longitudinal axis of the model lies horizontal. As soon as the model flies free, the mad-looking swings will become weaker, so that you will keep an unhurt model in spite of a very probable chinese landing.

In case you high-start a model that has only insufficient lateral stability the assistant must give it free in the moment when the ship swings aside. It has hereby already attained sufficient altitude and has not—even if making a wing landing —so high a speed, as if it would rush down with the full acceleration of the rope not yet slipped off.

At the end of my little essay I might not miss to point out in brief the possibilities of the tailless in the rubber powered field. Though we have not done much work on rubber powered ships in this country, it can—for the greatest part—be explained by the fact, that we have chiefly more gliders than rubber or gas models.

The installation of a rubber motor in the fuselage will mostly demand the use of inversional driving gears, unless one uses a very long fuselage, which is not advisable; in consequence of this the solution of installing the skein in the wing—as mentioned above—is to be preferred. By the way, I should recommend that the motor does not extend till the tips because it could render the problem of lateral stability still more difficult.

At the time of writing these lines I learn that English modellers have not been lazy. Quite the contrary there seem to be some lads that have had some success with these queer birds. The ship of Mr. Goodsir has already attained a fine performance, the duration up to now being around 49 scs. Some data about this model might interest you, therefore I have added same, so far as I know it. As you can see from the sketch the ship is a midwing. The attachment of the wing to the monocoque fuselage is quite interesting, as Mr. Goodsir has incorporated a slot which allows for a careful adjustment. The wing which has a span of 98 cm. has the airfoil RAF—34. The sweepback on the outer panels is 47 degrees for the leading edge and 27 degrees for the trailing edge. The outer panels are washed to minus 4-1/2 degrees at the tips, while the angle of incidence is zero at the fuselage. The area of the wing is 13.4 dm^2 which would allow for a participation for the Wakefield Cup, if the weight would be brought up to the required 227 grams. With the now installed motor of 14 strands = 43 grams the ship has a weight of 198 grams ready to fly. I don't know whether the builder intends to compete for this Cup but anyway he ought to try a stronger motor in this ship and watch results. As the ship has been equipped with movable ailerons the adjustments should not be too difficult with a stronger motor and probably the resulting, more rapid climb will pay soon.

On the whole I can say that the construction of a tailless demands the utmost accuracy, perhaps more than on any other model, for already slight mistakes impress the flying qualities very unpleasantly. He who builds clean and accurate ships will soon get the right adjustments at the test flights of his crate and then you will not have to wait for some success.

There has been published a long series of good plans of successful competition models in Germany, among them the above mentioned "H.A.W.K.," the "Leipziger Nurflügel," and flying planks in different species, which can only be recommended to the beginner in building tailless, because he himself perceives what is the question when building such a model, and he does not have to grope about in the gloom when he constructs a machine of his own. Well, chaps, how about a tailless?

Tricky "Props" For Flighty Ships

(Continued from page 25)

washers, which every modeler is sure to have on his workbench. This particular type has yet to fail—it has worked perfectly on all occasions.

To make these types of folding props is very easy so we will now get to work. The first thing that must be done is to carve a prop in the usual manner; but if the builder so wishes, he may take an old prop and use it. After the prop has been carved and the usual fine finish put on it we will start on the folding part. Using a coping saw, make the cut as shown on the plans. No dimensions are given for the reason that the device can be put on a prop of any size. After this cut has been made, take a piece of .040 wire and bend it as shown on the plans. Be careful when bending to make the parts as accurate as possible, for to have a smooth working prop the parts must

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work properly. After the wire is bent the washers and wire are cemented in place very lightly. When these parts are dry try out the mechanism to see if it is working smoothly. If not, make the necessary changes and cement securely with about three coats, putting a cement skin around the part indicated on the plans. This precaution will assure one that his prop will stay together under the most trying conditions.

The other type shown uses hinges of 1/32" sheet brass. Simply take the piece of brass and after cutting as shown, roll the ends around a piece of wire and solder securely, using as little solder as possible. Make the two pieces as shown and be sure that they work smoothly. The pinholes are then punched in the hinge and you are ready to cement on the prop. The pinholes in the brass allow an extra holding place. Use the above precautions in regards to cementing.

While this is drying put a rubber tensioner on your plane, to stop the prop in the correct position on every flight. The one shown is a departure from the usual practice but one which will work perfectly on every flight. The best place to stop the prop is in a horizontal position alongside the fuselage. Of course you may stop the prop in any position but the place specified has worked the best.

Just try a folding prop on your next ship, and instead of coming down, your ship will seem to be actually climbing.

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1938 MODEL AERONAUTICS YEAR BOOK

Vernon Boehle Says:

SOME of the later developments on model aircraft are the folding propeller, gear mechanism which permits the use of two, three or four motors, and the gradual turning by model designers toward more streamlining.

Perhaps some of you model builders have noticed the fine glide that a gas model possesses. This is largely due to the small size of the propeller which offers but little resistance even though it does not freewheel. The largest gas model uses a smaller propeller than a three to four foot rubber powered model. The large props on a rubber powered model although tending to increase the efficiency, do not help the glide. Even though they may be free-wheeling props they have considerable drag.

Last summer I saw a model on which was used a propeller which folded back, and it increases the glide by about 25%. A model equipped with this type propeller should greatly increase its duration, especially in calm air, when there is little or no thermal air currents.

A propeller of this type is carved the usual way, then cut in three sections, one cut on each side of the prop shaft and approximately one inch from it. The two blades are then hinged, the hinges being put on the back which allows the two blades to fold back but not forward. When the rubber motor is unwinding, the action of the air on the blades and centrifugal force, keeps the blades straightened out till the power is exhausted, when the resistance of the blades forces them to fold back. Freewheeling is also used on this type propeller and these two methods combine to practically eliminate propeller resistance.

The use of gears on model airplanes although having been experimented with for a number of years, still hasn't proved itself to be superior to the usual type of direct drive motors. The reason for this is that a gear model can hardly be built that is not one-half to one ounce overweight. If it is within the usual weight limit, that of one ounce to every fifty square inches of wing area, it will not be strong enough to withstand the usual bumps and crack-ups that models are liable to have.

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Many model builders will argue that this should make little difference, because the amount of winds which can be put in two motors should be double the amount that can be put in a single motor. However, they forget that the heavier the model the more rubber is needed, and if the number of strands are increased the weight increases still more; to say nothing of the loss of power due to the friction of the gears and the difficulties experienced in winding the model.

The Plane on the Cover

(Continued from page 25)

Vaim, which conducts research work in the strength of aeronautical materials.

The Zagi, which was under the personal direction of Ing. A. N. Toupolev until his death several months ago, designs and constructs experimental prototypes only. These are then subjected to strenuous flight and strength tests. Upon satisfactory completion of these tests, they are turned over to the Glavavioprom for production in one of Russia's twelve large aircraft factories. These, as well as the U.S.S.R.'s five aviation engine factories, are located far from frontier borders for strategic reasons, Moscow being the chief center of industry.

The principal plant is No. 22 located at Fili, on the outskirts of Moscow, where 25,000 workers are employed in three eight-hour shifts throughout each 24 hours. It is capable of producing from 200 to 350 twin-engine bombers yearly. Plant No. 21, near Gorki (formerly Nijna Novgorod) can produce five single-seat fighters a day. However, the remaining plants are understaffed due to the shortage of skilled labor and some are in operation only part-time.

Of all-metal construction, the I.17 fighter features a thin, narrow fuselage housing the giant, liquid-cooled engine and the pilot in form-fitting quarters. Construction is of steel tubing with stiffeners and formers made of Deskaba steel, the Russian equivalent of our Duralumin. The wing is built up on a single, heavily riveted, tubular spar girder. Ribs are of Deskaba steel and are heavily drag-braced with steel wire. The wings and the fuselage aft of the metal engine cowl are fabric covered, heavily doped and varnished.

The landing gear is of the wide-tread retractable type, features a novel system of retraction, and is of such length as to give the little craft the amazing ground angle of twenty-one degrees! In order to extend well forward of the center of gravity and yet clear the main wing spar when retracted, a system of retraction wherein the gear swings laterally and to the rear had to be devised. This was accomplished with the design of a unit in which the radius rod swings out as the gear rotates up and to the rear. The aperture is sealed with metal fairing pieces on the gear struts.

The tail units are of metal construction, fabric covered, and are unbalanced. Tail drag is taken by a standard skid-type unit.

The pilot is located amidship and is protected by a long, low windshield of steel and shatterproof glass construction. The control column is of the wartime spade-grip type, upon which are located the four normal triggers for the gun controls. Engine and flight instruments of Russian and German manufacture are carried.

Power is supplied by a Hispano-Suiza 12 Ycrs type M-100 engine, re-designed by Ing. A. N. Toupolev, and develops 1,300 horsepower. This is the standard twelve cylinder Spanish motor manufactured under license in Moscow, with special milled heads, high-lift cams, specially designed dual carburetors, and a secret cylinder-head coolant developed by the Zaim. This special cooling liquid is cooled in two retractable radiators located in each wing panel. The propeller is of Russian design and is of the two-bladed, highly tapered steel type featuring an abnormally high pitch at the tips.

Armament aboard the I.17 consists of four forward firing machine guns located in pairs in each wing panel and a 20 millimeter cannon firing through the nose. This deadly weapon is located between the banks of the "V" shaped engine and can fire 1,000 rounds, weighing 3/4 pound each, per minute.

Performance figures published in Z. K. Borkovski's report to the Zaim claim a maximum speed of 480 kilometers per hour (300 miles per hour) and a cruising speed of 415 kilometers per hour (260 miles per hour.) The 2,200 miles cruising range claimed for the craft is exceptional for such an interceptor-type fighting plane. It has a service ceiling of 32,000 feet and can climb 3,400 feet per minute.

The Glavavioprom favors the production system in which a small number of standard machines may be mass-produced. The I.5 single-seat biplane (July, 1937, issue of MODEL AIRPLANE NEWS) still constitutes the bulk of Russia's fighting squadron equipment but the I.16 and I.17 fighters are being produced in large quantities for re-equipment.

Actual use of the Z.K.B.19 (I.17) in the Spanish revolutionary conflict has been verified in a recent letter from Charles Ewing, newsreel photographer and newspaperman in the very heart of the fighting. He writes: "Late that afternoon this same squadron returned and bombed us again. However, they were accompanied this time by two yellow, low-winged monoplanes of foreign make. They were very small and very fast and their nose cannons kept popping away at our defending ships which rose to meet them for the better part of a half-hour. One of the pilots seemed to have difficulty keeping his landing carriage up in the wing. It would drop out and he would draw it back up again with ridiculous regularity. I am still wondering if he was able to make a decent landing at his field."

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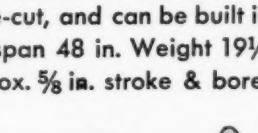

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